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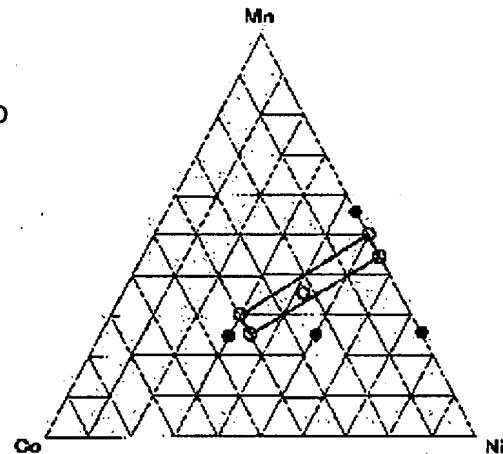
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## (54) POSITIVE ELECTRODE ACTIVE MATERIAL, ITS MANUFACTURING METHOD, AND SECONDARY BATTERY USING THE SAME

(57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a manufacturing method of a positive electrode active material for a secondary battery having high energy density and excellent repetitive charge-discharge performance and to provide a secondary battery using it.

**SOLUTION:** This secondary battery uses a positive electrode active material  $LixMnaNibCocO_2$  obtained by heat-treating a mixture comprising a trivalent transition metal compound in a temperature range of 950-1100°C, (where, a, b and c should be positioned in a range shown by a region surrounded by lines connecting four points comprising a point A (a, b, c)=(0.5, 0.5, 0), a point B (0.45, 0.55, 0), a point C (0.25, 0.35, 0.4) and a point D (0.3, 0.3, 0.4) on a ternary state diagram expressing the relationship thereof, and X should be  $0.95 \leq x/(a+b+c) \leq 1.05$ ).



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**CLAIMS**

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**[Claim(s)]**

[Claim 1] LixMn<sub>a</sub>Ni<sub>b</sub>Co<sub>c</sub>O<sub>2</sub> (however, a, b, and c) In the 3 yuan state-diagram top showing the relation Point A(a, b, c) = (5 0. 5 0. 0), Point B (55 0. 45 0. 0), Point C (35 0. 25 0. 0.4) the range shown in the field surrounded in the straight line which connected four points which consist of points D (3 0. 3 0. 0.4) -- it is -- 0.95 <=x/(a+b+c) <=1.05 -- it is -- the positive active material which consists of a multiple oxide shown.

[Claim 2] The manufacture approach of the positive active material characterized by heat-treating the mixture containing the compound of all the transition-metals elements that constitute said positive active material among the transition-metals element groups which manufacture the positive active material which contains Mn and nickel in a configuration element at least, and which are approaches and consist of Mn, nickel, and Co in 950-degree-C or more temperature requirement 1100 degrees C or less.

[Claim 3] Said compound is the manufacture approach of the positive active material according to claim 2 characterized by being the compound of trivalent transition metals.

[Claim 4] It is the manufacture approach of the positive active material according to claim 2 obtained by said compound's being a compound of trivalent transition metals, and carrying out wet blending of said mixture.

[Claim 5] The manufacture approach of the positive active material according to claim 2 characterized by heat-treating the mixture which was made to generate precipitate in addition to the alkaline water solution which contains a lithium element for the water solution which comes to dissolve the trivalent compound of all the transition-metals elements that constitute said positive active material among the transition-metals element groups which consist of nickel and Co, and the water solution which comes to dissolve the compound of Mn, and was obtained as said precipitate.

[Claim 6] Said mixture is the manufacture approach of the positive active material according to claim 2 to 5 characterized by including a boron compound.

[Claim 7] The manufacture approach of positive active material according to claim 3 to 6 that Mn compounds contained in said mixture are Mn<sub>2</sub>O<sub>3</sub>andnH<sub>2</sub>O.

[Claim 8] The manufacture approach of positive active material according to claim 3 to 7 that nickel compounds contained in said mixture are nickel<sub>2</sub>O<sub>3</sub>andnH<sub>2</sub>O.

[Claim 9] The manufacture approach of positive active material according to claim 3 to 8 that Co compounds contained in said mixture are Co<sub>2</sub>O<sub>3</sub>andnH<sub>2</sub>O.

[Claim 10] The manufacture approach of positive active material according to claim 1 characterized by using the manufacture approach according to claim 2 to 9.

[Claim 11] Positive active material according to claim 1 characterized by being obtained using the manufacture approach according to claim 2 to 9.

[Claim 12] The rechargeable battery which has the positive electrode containing positive active material according to claim 1 or 11, a negative electrode using the negative-electrode ingredient which can occlusion emit a lithium ion, and a nonaqueous electrolyte.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

**[Field of the Invention]** This invention relates to the manufacture approach of the positive active material for cells, and the nonaqueous electrolyte rechargeable battery which used it.

**[0002]**

**[Description of the Prior Art]** Nonaqueous electrolyte rechargeable batteries, such as a lithium secondary battery, show high energy density, and since they are high voltages, they are widely used as a power source to a small personal digital assistant, a mobile communication device, etc. It is required for the positive active material for lithium secondary batteries also by the repeat of the insertion and desorption of a lithium that the crystal structure should be stable and electrochemical actuation capacity should be large. The lithium content transition-metals oxide with which operating potential considers lithium cobalt oxide and the lithium nickel oxide of the layer structure, or a lithium manganic acid ghost with Spinel structure as a basic configuration as a thing of the 4V neighborhood is known.

[0003] The multiple oxide of the lithium of LiCoO<sub>2</sub>, LiNiO<sub>2</sub>, LiMnO<sub>2</sub>, and LiMn<sub>2</sub>O<sub>4</sub> grade and transition metals is known as positive active material of the nonaqueous electrolyte rechargeable battery which has current and 4V class action potential. Although the lithium cobalt multiple oxide expressed with LiCoO<sub>2</sub> grade in the positive active material which has alpha-NaFeO<sub>2</sub> structure where a high energy consistency is expectable, especially was widely used for the noncommercial lithium ion battery etc., cobalt is a rare metal and there was a problem that a price was high. Moreover, since high energy density is shown even if it compares with LiCoO<sub>2</sub> or LiMn<sub>2</sub>O<sub>4</sub> the lithium nickel complex oxide expressed with LiNiO<sub>2</sub> grade, many of the utilization examination is made. However, since change took place to the crystal structure in connection with charge and discharge, said LiNiO<sub>2</sub> had the trouble that charge/discharge capability ability was bad.

[0004] About this cause Kanno, R.;Kubo, H.;Kawamoto, Y.Kamiyama, T.;Izumi, F.;Takeda, Y.;Takano, and M.Phase Relationship and Lithium Deintercalation According to in Lithium Nickel Oxides.J.Solid Sate Chem.110(2), 1994, and 216-225. It is supposed that it will be because Li is desorbed from nickel (II) salt used for a raw material with gestalten, such as Li<sub>2</sub>O, in the process in which nickel (III) is oxidized under an oxygen ambient atmosphere 600 degrees C or more. Since nickel or Li is irregularly spread to such a site that suffered a loss, Li migration is checked and it is thought that this causes a capacity fall.

[0005] As a means to solve this, the technique in which a different-species element permutes nickel site of LiNiO<sub>2</sub> is indicated widely. For example, the technique concerning a Li-Mn-nickel-O element system is indicated by the U.S. Pat. No. 5626635 official report (1997). Moreover, the technique concerning a Li-Mn-nickel-Co-O element system is indicated by a U.S. Pat. No. 6040090 official report (2000) and JP,8-213015,A. Although each of these active materials showed the high initial discharge engine performance, its capacity fall by the repeat of charge and discharge was large, and they had not resulted in utilization.

[0006] Moreover, if it compounds at an elevated temperature 800 degrees C or more in order to permute

some nickel by Mn certainly, it is pointed out to JP,8-171910,A that nickel and Mn enter the site into which Li should go in a crystal, the crystal structure is confused, and cycle reversibility and discharge capacity fall. For this reason, in this official report, the value of alpha expressed with  $\text{LiNi}_1\text{-alphaMnalphaO}_2$  was set to 0.05-0.30, and the problem is solved by calcinating at 600 degrees C - 800 degrees C.

[0007]

[Problem(s) to be Solved by the Invention] This invention is made in view of said trouble, and aims at offering the rechargeable battery using the manufacture approach of the positive active material for rechargeable batteries with high energy density and good repeat charge/discharge capability ability, and it.

[0008]

[Means for Solving the Problem] This invention is  $\text{Li}_{x}\text{Mn}_a\text{Ni}_b\text{Co}_c\text{O}_2$  (however, a, b, and c). In the 3 yuan state-diagram top showing the relation Point A(a, b, c) = (5 0. 5 0. 0), Point B (55 0. 45 0. 0), Point C (35 0. 25 0. 0.4) the range shown in the field surrounded in the straight line which connected four points which consist of points D (3 0. 3 0. 0.4) -- it is --  $0.95 \leq x/(a+b+c) \leq 1.05$  -- it is -- it is the positive active material which consists of a multiple oxide shown.

[0009] Moreover, it is the approach of manufacturing the positive active material which contains Mn and nickel in a configuration element at least, and is the manufacture approach of the positive active material characterized by heat-treating the mixture containing the compound of all the transition-metals elements that constitute said positive active material among the transition-metals element groups which consist of Mn, nickel, and Co in 950-degree-C or more temperature requirement 1100 degrees C or less.

[0010] Moreover, said compound is the manufacture approach of the positive active material characterized by being the compound of trivalent transition metals.

[0011] Moreover, said compound is a compound of trivalent transition metals, and said mixture is the manufacture approach of the positive active material obtained by carrying out wet blending.

[0012] Moreover, it is the manufacture approach of the positive active material characterized by heat-treating the mixture which was made to generate precipitate in addition to the alkaline water solution which contains a lithium element for the water solution which comes to dissolve the trivalent compound of all the transition-metals elements that constitute said positive active material among the transition-metals element groups which consist of nickel and Co, and the water solution which comes to dissolve the compound of Mn, and was obtained as said precipitate.

[0013] Moreover, said mixture is the manufacture approach of the positive active material characterized by including a boron compound.

[0014] Moreover, Mn compound contained in said mixture is the manufacture approach of the positive active material which is  $\text{Mn}_2\text{O}_3\text{andnH}_2\text{O}$ .

[0015] Moreover, nickel compound contained in said mixture is the manufacture approach of the positive active material which is  $\text{nickel}_2\text{O}_3\text{andnH}_2\text{O}$ .

[0016] Moreover, Co compound contained in said mixture is the manufacture approach of the positive active material which is  $\text{Co}_2\text{O}_3\text{andnH}_2\text{O}$ .

[0017] Moreover,  $\text{Li}_{x}\text{Mn}_a\text{Ni}_b\text{Co}_c\text{O}_2$  (however, a, b, and c) characterized by being obtained using these manufacture approaches In the 3 yuan state-diagram top showing the relation Point A(a, b, c) = (5 0. 5 0. 0), Point B (55 0. 45 0. 0), Point C (35 0. 25 0. 0.4) the range shown in the field surrounded in the straight line which connected four points which consist of points D (3 0. 3 0. 0.4) -- it is --  $0.95 \leq x/(a+b+c) \leq 1.05$  -- it is -- it is the manufacture approach of the positive active material which consists of a multiple oxide shown.

[0018] Moreover, it is the positive active material characterized by being obtained using these manufacture approaches.

[0019] Moreover, it is the rechargeable battery which has the positive electrode containing said positive active material, a negative electrode using the negative-electrode ingredient which can occlusion emit a lithium ion, and a nonaqueous electrolyte.

[0020] The operation effectiveness of this invention is as follows. However, presumption is included

about the mechanism of action and the right or wrong of the mechanism of action do not restrict this invention.

[0021] That is, this invention persons paid their attention to the oxidation number of the metallic element in metallic oxides, such as a metal hydroxide metallurgy group compound hydroxide used as a raw material or a precursor, while examining the above-mentioned trouble wholeheartedly. In compounding the multiple oxide of alpha-NaFeO<sub>2</sub> structure, namely, the oxidation number of the metallic element of Mn compound used for a raw material, nickel compound, and Co compound When neither was trivalent and the compounded metal multiple oxide is used as positive active material of a lithium cell, The discharge capacity in the potential of the 4V neighborhood is not not only fully obtained to the potential of a metal lithium, but it was shown clearly that degradation of the cell engine performance occurs by existence of the element with which valences differ. On a powder X-ray diffraction Fig., if the metallic element which specifically has a different valence exists, even if it belongs with a single phase, a local distortion will exist in the crystal structure of said multiple oxide, and it will be thought that it becomes the cause conduction of Li ion in said multiple oxide crystal is not only checked, but by which said crystal structure collapses by the repeat of charge and discharge.

[0022] That is, this invention unifies the valence of a raw material or a precursor with trivalent, it is making the oxidation state of a start raw material uniform, and needs to control neither temperature nor an ambient atmosphere by the heat treatment process, and offers the approach which there is no impurity and can compound the very high multiple oxide of degree of crystallinity efficiently. Thus, the obtained positive active material has large energy density, and turns into positive active material for rechargeable batteries with few capacity falls also by the repeat of charge and discharge.

[0023] In the multiple oxide LixMnaNibCocO<sub>2</sub> compounded by the manufacture approach of this invention, the value of a, b, and c can be set as arbitration by defining the mixing ratio of each transition-metals compound contained in the mixture before heat treatment.

[0024] The transition-metals compound used for the mixture before heat treatment In the range which chooses that all whose oxidation numbers of said transition-metals element are trivalent Although not limited especially, manganic oxide, 3 oxidation 2 nickel, Choosing from 3 oxidization 2 cobalt is desirable, and if the thing of the form of monohydrate M (III) 2O<sub>3</sub> and nH<sub>2</sub>O (however, M Mn, nickel or Co, n= 1) is chosen especially, handling is easy and it is more desirable at the point of the ability to make phase transition perform at low temperature.

[0025] As for said mixture before heat treatment, it is desirable that the boron compound is included further. If said mixture contains boron, since the sintering effectiveness can be discovered at the time of heat treatment and the crystalline high quality of the specified substance can be produced efficiently, it is desirable. Especially as a boron compound to be used, although not limited, a boric acid, boron oxide, etc. can be used suitably. Although it is not limited, if especially the amount of the boron compound included in said mixture is made into 0.001 to 0.1 times by the element ratio to the amount (a+b+c) of a transition-metals element when the multiple oxide which is the specified substance is expressed with LixMnaNibCocO<sub>2</sub>, since it does not spoil the cell engine performance but can demonstrate the good sintering effectiveness, it is desirable.

[0026] Although the lithium compound as a raw material used with said transition-metals compound does not pose a problem no matter what compound it may use, it can use a lithium hydroxide, a lithium carbonate, etc. suitably, for example.

[0027] Selection of heat treatment temperature is very important. For example, neither repeat charge/discharge capability ability nor discharge capacity is good as above mentioned JP,8-171910,A points out, when it heat-treats at 850 degrees C, having used as Mn:nickel:Co=11:9:0 the element ratio of the transition-metals compound contained in said mixture. However, it found out that the multiple oxide which has a discharge capacity high when said heat treatment temperature is made into 950 degrees C or more, having used as Mn:nickel:Co=11:9:0 the element ratio of the transition-metals compound contained in said mixture the same, for example as a result of this invention persons' inquiring wholeheartedly in a very surprising thing, and was excellent in it at especially repeat charge/discharge capability ability was compoundable. The multiple oxide of the latter which made heat

treatment temperature 1000 degrees C was presenting a clearly different black hue from the former to the matter of the former which made heat treatment temperature 850 degrees C presenting the dark brown hue. On the other hand, since there is an inclination for discharge capacity to fall when heat treatment temperature exceeds 1100 degrees C, as for heat treatment temperature, it is desirable to consider as 1100 degrees C or less.

[0028] It is very important for said mixture before heat treatment that each transition-metals compound in which said mixture is constituted, and the lithium compound of each other are mixed by homogeneity. Especially as an approach of obtaining said mixture mixed by homogeneity, it is not limited and the transition-metals compound (Mn (III) oxide, nickel (III) oxide, and Co (III) oxide) which adjusted particle size beforehand may be blended dryly, and wet blending may be carried out where said transition-metals compound is included. Since uniform mixture will be easy it to be ground, not to control particle size separately since the continuing granulation process can be made to perform simple, and to be obtained in the process of this wet blending especially while each particle is mixed if a wet-blending method is used, it is desirable.

[0029]

[Embodiment of the Invention] Although the gestalt of operation of this invention is illustrated below, this invention is not limited to the gestalt of the following operations.

[0030] The nonaqueous electrolyte cell concerning this invention consists of a positive electrode which makes positive active material main constituents, a negative electrode, and nonaqueous electrolyte which the electrolyte salt contained in the non-aqueous solvent, and, generally a separator is formed between a positive electrode and a negative electrode.

[0031] As for nonaqueous electrolyte, what the use to a lithium cell etc. is generally proposed as is usable. As a non-aqueous solvent, propylene carbonate, ethylene carbonate, Annular carbonates, such as butylene carbonate, chloroethylene carbonate, and vinylene carbonate; Gamma-butyrolactone, Cyclic ester, such as gamma-valerolactone; Dimethyl carbonate, diethyl carbonate, Chain-like carbonate, such as ethyl methyl carbonate; Methyl formate, methyl acetate, chain-like ester [, such as methyl butyrate, ]; -- tetrahydrofuran or its derivative; -- 1 and 3-dioxane -- 1,4-dioxane, 1, 2-dimethoxyethane, 1, 4-dibutoxy ethane, Ether, such as a methyl jig lime; although independent or these two or more sorts of mixture, such as nitril; dioxolane or its derivative; ethylene sulfides, such as an acetonitrile and a benzonitrile, a sulfolane, a sultone, or its derivative, etc. can be mentioned It is not limited to these.

[0032] As an electrolyte salt, for example Lithiums, such as LiClO<sub>4</sub>, LiBF<sub>4</sub>, LiAsF<sub>6</sub>, LiPF<sub>6</sub>, LiSCN, LiBr, LiI, Li<sub>2</sub>SO<sub>4</sub>, Li<sub>2</sub>B10Cl<sub>10</sub>, NaClO<sub>4</sub> and NaI, NaSCN, NaBr, KClO<sub>4</sub>, and KSCN (Li), The inorganic ion salt containing one sort of sodium (Na) or a potassium (K), LiCF<sub>3</sub>SO<sub>2</sub>, LiN(CF<sub>3</sub>SO<sub>2</sub>)<sub>2</sub>, LiN(C<sub>2</sub>F<sub>5</sub>SO<sub>2</sub>)<sub>2</sub>, LiN(CF<sub>3</sub>SO<sub>2</sub>)(C<sub>4</sub>F<sub>9</sub>SO<sub>2</sub>), LiC<sub>3</sub>LiC(CF<sub>3</sub>SO<sub>2</sub>)<sub>3</sub>, (C<sub>2</sub>F<sub>5</sub>SO<sub>2</sub>)<sub>4</sub>NBF<sub>4</sub>, (CH<sub>3</sub>)<sub>4</sub>NBr, (CH<sub>3</sub>)<sub>4</sub>NCIO<sub>4</sub>, 4(C<sub>2</sub>H<sub>5</sub>)NI, 4(C<sub>3</sub>H<sub>7</sub>)NBr, 4(n-C<sub>4</sub>H<sub>9</sub>)NCIO<sub>4</sub>, 4(n-C<sub>4</sub>H<sub>9</sub>)NI, 4(C<sub>2</sub>H<sub>5</sub>)N-maleate, 4(C<sub>2</sub>H<sub>5</sub>)N-benzoate, 4(C<sub>2</sub>H<sub>5</sub>)N-phtalate, (C<sub>2</sub>H<sub>5</sub>) Organic ion salts, such as a stearyl sulfonic-acid lithium, an octyl sulfonic-acid lithium, and the dodecylbenzenesulfonic acid lithium, etc. are mentioned, and it is possible independence or for two or more kinds to be mixed and to use these ionicity compounds.

[0033] Furthermore, since electrolytic viscosity can be further lowered by mixing and using the lithium salt which has a perfluoroalkyl radical like LiBF<sub>4</sub> and LiN(C<sub>2</sub>F<sub>5</sub>SO<sub>2</sub>)<sub>2</sub>, a low-temperature property can be raised further and it is more desirable.

[0034] In order to obtain certainly the nonaqueous electrolyte cell which has a high cell property as concentration of the electrolyte salt in nonaqueous electrolyte, 0.1 mol/l - 5 mol/l is 0.5 mol/l - 2.5 mol/l desirable still more preferably.

[0035] The electrode with which the electrode which consisted of lithium content transition-metals oxides was constituted from graphite by the negative electrode is suitably used for the positive electrode of the lithium secondary battery of this invention.

[0036] As positive active material which is the main constituent of a positive electrode, it is desirable independent or to mix and to use lithium content transition-metals oxide, lithium content phosphate, a lithium content sulfate, etc. As a lithium content transition-metals oxide, it is general formulas LixMX<sub>2</sub>

and  $\text{Li}_x\text{M}_{\text{N}}\text{NyX}_2$  ( $\text{M}$  and  $\text{N}$  show a VIII group's metal from I, and  $\text{X}$  shows chalcogen compounds, such as oxygen and sulfur.), for example, they are  $\text{Li}_{\text{y}}\text{Co}_{1-\text{x}}\text{M}_{\text{x}}\text{O}_2$  and  $\text{Li}_{\text{y}}\text{Mn}_{2-\text{x}}\text{M}_{\text{x}}\text{O}_4$  (as for  $\text{M}$ , a VIII group's metal (metaphors are one or more kinds of elements of Li, calcium, Cr, nickel, Fe, and Co) etc. is mentioned from I.). Although it is effective to the peak which can be permuted about  $x$  values which show the amount of different-species element permutations of this lithium content transition-metals oxide, it is  $0 <= \text{x} <= 1$  from the point of discharge capacity preferably. Moreover, about  $y$  value which shows the amount of lithiums, the peak which can use a lithium reversibly is effective, and it is  $0 <= \text{y} <= 2$  from the point of discharge capacity preferably. Although mentioned, it is not limited to these.

[0037] Other positive active material may be mixed and used for said lithium content compound. Moreover, as other positive active material  $\text{CuO}$ ,  $\text{Cu}_2\text{O}$ ,  $\text{Ag}_2\text{O}$ ,  $\text{CuS}$ , I group metallic compounds of  $\text{CuSO}_4$  grade, IV group metallic compounds, such as  $\text{TiS}_2$ ,  $\text{SiO}_2$ , and  $\text{SnO}$ ,  $\text{V}_2\text{O}_5$ ,  $\text{V}_6\text{O}_{12}$ ,  $\text{VO}_x$  and  $\text{Nb}_2\text{O}_5$ ,  $\text{Bi}_2\text{O}_3$ , V group metallic compounds of  $\text{Sb}_2\text{O}_3$  grade,  $\text{CrO}_3$ ,  $\text{Cr}_2\text{O}_3$ ,  $\text{MoO}_3$ ,  $\text{MoS}_2$  and  $\text{WO}_3$ , VI group metallic compounds of  $\text{SeO}_2$  grade, Are expressed by VIII group metallic compounds, such as VII group metallic compounds of  $\text{MnO}_2$  and  $\text{Mn}_2\text{O}_3$  grade,  $\text{Fe}_2\text{O}_3$ ,  $\text{FeO}$  and  $\text{Fe}_3\text{O}_4$ ,  $\text{nickel}_2\text{O}_3$ , and  $\text{NiO}$ ,  $\text{CoO}_3$ ,  $\text{CoO}$ , etc. For example, metallic compounds, such as a lithium-cobalt system multiple oxide and a lithium-manganese system multiple oxide, Furthermore, although conductive polymer compounds, such as disulfide, polypyrrole, the poly aniline, poly para-phenylene, polyacetylene, and the poly acene system ingredient, a pseudo-graphite structure carbonaceous ingredient, etc. are mentioned, it is not limited to these.

[0038] a positive electrode -- said lithium content transition-metals oxide -- an electric conduction agent and a binder -- further -- the need -- responding -- a filler -- kneading -- a positive electrode -- this positive electrode after considering as a mixture -- it is produced by applying or sticking a mixture to a foil, a lath plate, etc. as a charge collector by pressure, and heat-treating it at the temperature of 50 degrees C - about 250 degrees C for about 2 hours.

[0039] As a negative-electrode ingredient, as long as it is a deposit or the thing of a gestalt which can carry out occlusion about a lithium ion, anything may be chosen. For example, carbon materials (for example, graphite, hard carbon, low-temperature baking carbon, amorphous carbon, etc.) besides a lithium metal, a lithium alloy (lithium metal content alloys, such as lithium-aluminum, lithium-lead, lithium-tin, lithium-aluminum-tin, a lithium-gallium, and a Wood metal), a lithium multiple oxide (lithium-titanium), and oxidization silicon etc. are mentioned. Also in these, graphite has the action potential very near a metal lithium, and can realize the charge and discharge in high operating potential. Moreover, since self-discharge can be lessened and irreversible capacity in charge and discharge can be lessened when lithium salt is adopted as an electrolyte salt, it is desirable as a negative-electrode ingredient. For example, an artificial graphite and a natural graphite are desirable. Especially the graphite that has embellished the negative-electrode ingredient particle front face with indeterminate form carbon etc. has the desirable generation of gas under charge from few things.

[0040] The analysis result by the X-ray diffraction of the graphite which can be suitably used for below etc. is shown.;

Lattice spacing ( $d_{002}$ ) 0.333-0.350nm Magnitude  $\text{L}_a$  of the microcrystal of the direction of an  $a$ -axis 20nm Above Magnitude  $\text{L}_c$  of the microcrystal of the direction of a  $c$ -axis 20nm Above True density It is also possible to add metallic oxides, such as a stannic-acid ghost and silicon oxide, Lynn, boron, amorphous carbon, etc. to 2.00 - 2.25 g/cm<sup>3</sup> and graphite, and to perform reforming to them. It is possible to control electrolytic disassembly and to raise a cell property by reforming the front face of graphite by the above-mentioned approach especially, and it is desirable. Furthermore, the graphite in which the lithium was inserted to graphite using together lithium metal content alloys, such as a lithium metal, lithium-aluminum, lithium-lead, lithium-tin, lithium-aluminum-tin, a lithium-gallium, and a Wood metal, etc. and by returning electrochemically beforehand is usable as a negative-electrode ingredient.

[0041] As for the fine particles of positive active material, and the fine particles of a negative-electrode ingredient, it is desirable that it is the average grain size of 100 micrometers or less. As for especially the

fine particles of positive active material, it is desirable that it is 10 micrometers or less in order to improve the high power property of a nonaqueous electrolyte cell. A grinder and a classifier are used in order to obtain fine particles in a predetermined configuration. For example, a mortar, a ball mill, a sand mill, a vibration ball mill, a planet ball mill, a jet mill, counter JIETOMIRU, a revolution air-current mold jet mill, a screen, etc. are used. At the time of grinding, wet grinding which made organic solvents, such as water or a hexane, live together can also be used. As the classification approach, there is especially no limitation and a screen, a pneumatic elutriation machine, etc. are used if needed in dry type and wet.

[0042] As mentioned above, although the positive active material and the negative-electrode ingredient which are the main constituent of a positive electrode and a negative electrode were explained in full detail, in said positive electrode and negative electrode, an electric conduction agent, a binder, a thickener, a filler, etc. may contain as other constituents other than said main constituents.

[0043] Although it will not be limited if it is the electronic conduction nature ingredient which does not have a bad influence on the cell engine performance as an electric conduction agent, conductive ingredients, such as natural graphites (flaky graphite, a scale-like graphite, earthy graphite, etc.), an artificial graphite, carbon black, acetylene black, KETCHIEN black, a carbon whisker, a carbon fiber, metal powder (copper, nickel, aluminum, silver, gold, etc.), a metal fiber, and a conductive ceramic ingredient, can usually be included as one sort or those mixture.

[0044] In these, acetylene black is more desirable than the viewpoint of electronic conduction nature and coating nature as an electric conduction agent. The addition of an electric conduction agent has 0.1 % of the weight - 50 desirable % of the weight to the AUW of a positive electrode or a negative electrode, and 0.5 % of the weight - its 30 % of the weight is especially desirable. Since a need carbon content is reducible if especially acetylene black is ground and used for a 0.1-0.5-micrometer ultrafine particle, it is desirable. These mixed approaches are physical mixing and the place made into the ideal is homogeneity mixing. Therefore, it is possible to mix the powder-mixing machine like a V shaped rotary mixer, a smooth S form mixer, a \*\*\*\*\* machine, a ball mill, and a planet ball mill with dry type or wet.

[0045] As said binder, the polymer which has the rubber elasticity of thermoplastics, such as polytetrafluoroethylene (PTFE), polyvinylidene fluoride (PVDF), polyethylene, and polypropylene, an ethylene-propylene-diene terpolymer (EPDM), sulfonation EPDM, styrene butadiene rubber (SBR), a fluororubber, etc. can usually be used as one sort or two sorts or more of mixture. The addition of a binder has 1 - 50 desirable % of the weight to the AUW of a positive electrode or a negative electrode, and its 2 - 30 % of the weight is especially desirable.

[0046] As said thickener, polysaccharide, such as a carboxymethyl cellulose and methyl cellulose, etc. can usually be used as one sort or two sorts or more of mixture. Moreover, as for a lithium and the thickener which has the functional group which reacts, it is desirable like polysaccharide to carry out to methylate, for example etc. and to carry out deactivation of the functional group. The addition of a thickener has 0.5 - 10 desirable % of the weight to the AUW of a positive electrode or a negative electrode, and its 1 - 2 % of the weight is especially desirable.

[0047] If it is the ingredient which does not have a bad influence on the cell engine performance as a filler, it is good anything. Usually, olefin system polymers, such as polypropylene and polyethylene, an amorphism silica, an alumina, a zeolite, glass, carbon, etc. are used. 30 or less % of the weight of an addition is [ the addition of a filler ] desirable to the AUW of a positive electrode or a negative electrode.

[0048] After making organic solvents, such as N-methyl pyrrolidone and toluene, mix said active material, an electric conduction agent, and a binder, a positive electrode and a negative electrode apply the obtained mixed liquor on the charge collector explained in full detail below, and are suitably produced by drying. About said method of application, although it is desirable to apply to the thickness of arbitration and the configuration of arbitration using means, such as roller coatings, such as an applicator roll, screen coating, a doctor blade method, spin coating, and bar coater, it is not limited to these, for example.

[0049] If it is the electronic conductor which does not do a bad influence in the constituted cell as a charge collector, it is good anything. For example, as a charge collector for positive electrodes, besides aluminum, titanium, stainless steel, nickel, baking carbon, a conductive polymer, electrically conductive glass, etc., it is the purpose on an adhesive property, conductivity, and an anti-oxidation disposition, and the object which processed front faces, such as aluminum and copper, with carbon, nickel, titanium, silver, etc. can be used. As a charge collector for negative electrodes, besides copper, nickel, iron, stainless steel, titanium, aluminum, baking carbon, a conductive polymer, electrically conductive glass, an aluminum-Cd alloy, etc., it is the purpose of an adhesive property, conductivity, and reducibility-proof, and the object which processed front faces, such as copper, with carbon, nickel, titanium, silver, etc. can be used. About these ingredients, it is also possible to oxidize a front face.

[0050] About the configuration of a charge collector, the shape of the shape of others and a film and a sheet and a network, punch or the object by which expanded one was carried out, a lath object, a porous body, a firing object, the organizer of a fiber group, etc. are used. [ shape / of foil ] Although there is especially no limitation of thickness, a 1-500-micrometer thing is used. It is desirable that aluminium foil excellent in oxidation resistance is excellent in reducibility-proof and conductivity, and uses cheap copper foil, a nickel foil, an iron foil, and the alloy foil containing those parts as a negative electrode as a positive electrode in these charge collectors. Furthermore, it is desirable that split-face surface roughness is a foil more than 0.2micromRa, and, thereby, the adhesion of positive active material or a negative-electrode ingredient, and a charge collector becomes the outstanding thing. Therefore, since it has such a split face, it is desirable to use an electrolysis foil. Especially the electrolysis foil that performed processing with Hana is the most desirable. furthermore, the case where double-sided coating is carried out to this foil -- the surface roughness of a foil -- the same -- or a, almost equal thing is desired.

[0051] It is desirable independent or to use together the porous film in which the outstanding rate property is shown as a separator for nonaqueous electrolyte cells, a nonwoven fabric, etc. As an ingredient which constitutes the separator for nonaqueous electrolyte cells For example, the polyolefine system resin represented by polyethylene, polypropylene, etc., The polyester system resin represented by polyethylene terephthalate, polybutylene terephthalate, etc., A polyvinylidene fluoride and vinylidene fluoride-hexafluoropropylene copolymer, A vinylidene fluoride-perfluoro vinyl ether copolymer, a vinylidene fluoride-tetrafluoroethylene copolymer, A vinylidene fluoride-trifluoro ethylene copolymer, a vinylidene fluoride-fluoro ethylene copolymer, A vinylidene fluoride-hexafluoroacetone copolymer, a vinylidene fluoride-ethylene copolymer, A vinylidene fluoride-propylene copolymer, a vinylidene fluoride-trifluoro propylene copolymer, A vinylidene fluoride-tetrafluoroethylene-hexafluoropropylene copolymer, a vinylidene fluoride-ethylene-tetrafluoroethylene copolymer, etc. can be mentioned.

[0052] A strong viewpoint to below 98 volume % of the void content of the separator for nonaqueous electrolyte cells is desirable. Moreover, more than 20 volume % of the viewpoint of a charge-and-discharge property to a void content is desirable.

[0053] Moreover, the polymer gel which consists of a polymer and electrolytes, such as acrylonitrile, ethylene oxide, propylene oxide, a methylmetaacrylate, vinyl acetate, vinyl pyrrolidone, and polyvinylidene fluoride, may be used for the separator for nonaqueous electrolyte cells.

[0054] When the nonaqueous electrolyte of this invention is used by the gel state as mentioned above, it is desirable at the point which is effective in preventing a liquid spill.

[0055] Furthermore, when porous film, a nonwoven fabric, etc. which were mentioned above, and polymer gel are used together and used, the electrolytic solution retention of the separator for nonaqueous electrolyte cells is desirable for a \*\*\*\*\* reason. namely, the film which covered the parent solvent nature polymer with a thickness of several micrometers or less to the front face and fine porous wall side of a polyethylene micropore film -- forming -- the fine hole of said film -- said parent solvent nature polymer gels by making an electrolyte hold inside.

[0056] The polymer over which the acrylate monomer which has an others and ethylene oxide radical, an ester group, etc., the epoxy monomer, the monomer which has an isocyanate radical constructed the bridge as said parent solvent nature polymer is mentioned. [ polyvinylidene fluoride ] As for this

monomer, it is possible to use a radical initiator together and to make crosslinking reaction perform using activity beams of light, such as an electron ray (EB), etc. in to use heating and ultraviolet rays (UV) \*\*\*\*.

[0057] It can be used for reinforcement or the purpose of physical-properties control, being able to blend with said parent solvent nature polymer the physical-properties regulator of the range which does not block formation of a bridge formation object. As an example of said physical-properties regulator, inorganic fillers {metal carbonates, such as metallic oxides, such as silicon oxide, titanium oxide, an aluminum oxide, magnesium oxide, a zirconium dioxide, a zinc oxide, and an iron oxide, a calcium carbonate, and a magnesium carbonate,} and polymers {polyvinylidene fluoride, vinylidene fluoride / hexafluoropropylene copolymer, a polyacrylonitrile, polymethylmethacrylate}, etc. are mentioned. The addition of said physical-properties regulator is usually 20 or less % of the weight preferably 50 or less % of the weight to a cross-linking monomer.

[0058] If it illustrates about said acrylate monomer, the partial saturation monomer of two or more organic functions will be mentioned suitably. More in an example 2 organic-functions (meta) acrylate {ethylene glycol di(metha)acrylate, Propyleneglycol di(meth) acrylate, an adipic acid and dineopentyl glycol S TERUJI (meta) acrylate, With a degrees of polymerization of two or more Pori ethylene glycol di(metha)acrylate, with a degrees of polymerization of two or more Pori propyleneglycol di(meth) acrylate, The di(meth)acrylate of a polyoxyethylene / polyoxypropylene copolymer, }, such as butanediol di(metha)acrylate and hexamethylene GURIKORUJI (meta) acrylate, 3 organic-functions (meta) acrylate {TORIMECHI roll pro pantry (meta) acrylate, GURISERINTORI (meta) acrylate, the Tori (meta) acrylate of the ethylene oxide addition product of a glycerol, The Tori (meta) acrylate of the propylene oxide addition product of a glycerol, } and the polyfunctional (meta) acrylate {pentaerythritol tetrapod (meta) acrylate, diglycerol hexa (meta) acrylate}, etc. of four or more organic functions, such as ethylene oxide of a glycerol and Tori (meta) acrylate of a propylene oxide addition product, are mentioned. independent in these monomers -- or it can use together and use.

[0059] In said acrylate monomer, 1 organic-functions monomer can also be added for the purpose, such as physical-properties adjustment. As an example of said 1 organic-functions monomer, an unsaturated-carboxylic-acid {acrylic acid, A methacrylic acid, a crotonic acid, a \*\*\*\* leather acid, a vinyl benzoic acid, a maleic acid, Boletic acid, an itaconic acid, a citraconic acid, mesaconic acid, a methylene malonic acid, } and partial saturation sulfonic acids {a styrene sulfonic acid, an acrylamide-isobutane sulfonic acid}, etc., such as aconitic acid, or those salts (Li salt --) Na salt, K salt, ammonium salt, tetra-alkyl ammonium salt, etc., These unsaturated carboxylic acid Moreover, aliphatic series or alicyclic alcohol of C1-C18, what was partially esterified by the alkylene (C2-C4) glycol, the polyalkylene (C2-C4) glycol, etc. (methylmalate --) what was amidated partially [ mono-hydroxyethyl malate etc. ] at ammonia and the 1st class, or secondary amine (the maleic-acid monoamide --) N-methyl-maleic-acid monoamide, N, and N-diethyl maleic-acid monoamide etc., (Meta) the aliphatic series (methyl and ethyl --) of acrylic ester [C1-C18 The ester of alcohol, such as propyl, butyl, 2-ethylhexyl, and stearyl, and an acrylic acid (meta), or an alkylene (C2-C4) glycol (ethylene glycol and propylene glycol --) polyalkylene (C2-C4) glycals (a polyethylene glycol --), such as 1,4-butanediol Ester [ of a polypropylene glycol and an acrylic acid (meta) ]]; (meta) Acrylamide or N-permutation (meta) acrylamide [(meta) acrylamide, ], such as N-methyl (meta) acrylamide and N-methylol(metha) acrylamide; Vinyl ester or allyl ester [vinyl acetate, ], such as an acetic-acid allyl compound; Vinyl ether or allyl compound ether [butyl vinyl ether, ], such as the dodecyl allyl compound ether; Unsaturated nitrile compound [(meta) acrylonitrile, ], such as croton nitril; Unsaturated alcohol [(meta) allyl alcohol etc.] partial saturation amine [(meta) allylamine, ], such as a dimethylaminoethyl (meta) acrylic rate and diethylaminoethyl (meta) acrylate; Heterocycle content monomer [N-vinyl pyrrolidone, ], such as vinylpyridine; Olefin system aliphatic hydrocarbon [ethylene, a propylene, ], such as a butylene, an isobutylene, a pentene, and an alpha olefin (C6-C50); Olefin system alicyclic hydrocarbon [cyclopentene, ], such as a cyclohexene, a cyclo heptene, and norbornene; Olefin system aromatic hydrocarbon [styrene, ]; partial saturation imide, such as alpha methyl styrene and a stilbene [maleimide] etc.; a halogen content monomer [a vinyl chloride, a vinylidene chloride, vinylidene

fluoride, hexafluoropropylene], etc. is mentioned.

[0060] When it illustrates about said epoxy monomer, glycidylethers {bisphenol A diglycidyl ether, Bisphenol F diglycidyl ether, bromination bisphenol A diglycidyl ether, }, such as phenol novolak glycidyl ether and cresol novolak glycidyl ether, Glycidyl ester {hexahydrophthalic acid glycidyl ester, }, glycidyl amines {triglycidyl isocyanurate, such as dimer acid glycidyl ester, }, such as a tetraglycidyl ether diamino phenylmethane, and a line -- aliphatic series epoxide {epoxidation polybutadiene -- }, such as epoxidized soybean oil, and alicycle group epoxide {3,4-epoxy-6-methylcyclohexylmethyl carboxylate, 3, and 4 epoxycyclohexylmethyl carboxylate} etc. are mentioned. They can be used for these epoxy resins, being able to add and stiffen independent or a curing agent.

[0061] As an example of said curing agent, aliphatic series polyamine {diethylenetriamine, }, such as -2, 4 and 8, and triethylenetetramine, 3, and 9-(3-aminopropyl) oxaspiro [ 10-TETORO ] [5, 5] undecane, Aromatic series polyamine {meta-xylene diamine, a diamino phenylmethane}, etc. Polyamides {dimer acid polyamide etc. acid-anhydrides} {phthalic anhydride, Tetrahydro methyl phthalic anhydride, hexahydro phthalic anhydride, trimellitic anhydride, Anhydrous methyl NAJIKKU acid}, phenols {a phenol novolak} etc., The poly mercaptan {polysulfide} etc., tertiary amines {a tris (dimethyl aminomethyl) phenol, 2-ethyl-4-methylimidazole}, etc., a Lewis acid complex {a boron trifluoride, an ethylamine complex}, etc., etc. are mentioned.

[0062] When it illustrates about the monomer which has said isocyanate radical, toluene diisocyanate, Diphenylmethane diisocyanate, 1, 6-hexamethylene diisocyanate, 2, 2, 4(2, 2, 4)-TORIMECHIRU-hexamethylene diisocyanate, p-phenylene diisocyanate, 4, and 4'-dicyclohexyl methane diisocyanate, 3, 3 '- dimethyl diphenyl 4 and 4'-diisocyanate, dianisidine diisocyanate, Meta xylene diisocyanate, trimethyl xylene diisocyanate, isophorone diisocyanate, 1, 5-naphthalene diisocyanate, trans-1, 4-cyclohexyl diisocyanate, lysine diisocyanate, etc. are mentioned.

[0063] In constructing a bridge in the monomer which has said isocyanate radical Polyol and polyamine [2 organic-functions compound {water, Ethylene glycol, propylene glycol, a diethylene glycol, }, such as dipropylene glycol, a 3 organic-functions compound {glycerol, trimethylol propane, }, such as 1, 2, 6-hexane triol, and triethanolamine, 4 organic-functions compound {pentaerythritol, Ethylenediamine, tolylenediamine, diphenylmethane diamine, }, such as a tetra-methylol cyclohexane and methyl glucoside, 5 organic-functions compound {2, 2 and 6, 6-tetrakis (hydroxymethyl) cyclohexanol, }, such as diethylenetriamine, a 6 organic-functions compound {sorbitol, a mannitol, }, such as dulcitol, 8 organic-functions compound {sault cloth etc.}, and polyether polyols {said polyol or the propylene oxide of polyamine, and/or an ethyleneoxide addition product} The polyester polyol [aforementioned polyol and a polybasic acid {adipic acid, o -- m -- para phthalic acid -- a succinic acid -- an azelaic acid -- a sebacic acid -- a ricinoleic acid -- } -- a condensate -- poly -- a caprolactone -- polyol -- {-- Pori -- epsilon - a caprolactone -- etc. -- } -- hydroxycarboxylic acid -- a polycondensation -- an object -- etc. -- ] -- etc. -- active hydrogen -- having -- a compound -- it can use together .

[0064] A catalyst can be used together in said crosslinking reaction. When it illustrates about said catalyst, organotin compounds and trialkylphosphine Amines [monoamine {N and N-dimethyl cyclohexylamine, }, such as triethylamine, and annular monoamines {a pyridine, N-methyl morpholine}, etc. Diamine {N, N, N', N'-tetramethylmethylenediamine, }, such as N, N, N', N'-tetramethyl 1, and 3-butanediamine, and triamine {N, N, N', N'-pentamethyl diethylenetriamine}, etc. Hexamines {N, N, and N'N'-tetrapod (3-dimethylaminopropyl)-methane diamine} etc. Those salts, such as annular polyamine {diazabicyclo octane (DABCO), N, and N'-dimethyl piperazine, 1,2-dimethylimidazole, 1, and 8-diazabicyclo (5, 4, 0) undecene -7 (DBU)} etc., etc. are mentioned.

[0065] After carrying out the laminating of the front stirrup to which the nonaqueous electrolyte cell concerning this invention carries out the laminating of for example, the separator for nonaqueous electrolyte cells, a positive electrode, and the negative electrode for an electrolyte, it is poured in, and finally it is suitably produced by closing by the sheathing material. Moreover, as for an electrolyte, in the nonaqueous electrolyte cell which comes to wind the generation-of-electrical-energy element with which the laminating of a positive electrode and the negative electrode was carried out through the separator for nonaqueous electrolyte cells, it is desirable to pour in a generation-of-electrical-energy

element before and after said winding. As a pouring-in method, it is possible to pour in by ordinary pressure, and the vacuum impregnation approach and the pressurization sinking-in approach are also usable.

[0066] As an ingredient of the sheathing object of a lithium secondary battery, the iron which carried out nickel plating, stainless steel and aluminum, a metal resin complex film, etc. are mentioned as an example. For example, the metal resin complex film of a configuration of having put the metallic foil with the resin film is desirable. Although it will not be limited if it is foils without a pinhole, such as aluminum, iron, nickel, copper, stainless steel, titanium, gold, and silver, as an example of said metallic foil, desirable lightweight and cheap aluminium foil is desirable. Moreover, considering the resin film which the polyethylene terephthalate film, the nylon film, etc. thrust and was excellent in reinforcement as a resin film by the side of the cell exterior as a resin film by the side of the interior of a cell, thermal melting arrival, such as a polyethylene film and a nylon film, is possible, and the film which has solvent resistance is desirable.

[0067] It is not limited especially about the configuration of a lithium secondary battery, and the coin cell which has the separator of a positive electrode, a negative electrode and a monolayer, or a double layer, a carbon button cell, the cylindrical cell which has the separator of the shape of a positive electrode, a negative electrode, and a roll further, a square shape cell, a flat mold cell, etc. are mentioned as an example.

[0068]

[Example] Although this invention is further explained below at a detail based on an example, this invention is not limited by the following publications and the cell configuration etc. is arbitrary in the positive active material of a test method or the cell to constitute, a negative-electrode ingredient, a positive electrode, a negative electrode, an electrolyte, and a separator list. In addition, as for the amount of the lithium salt (LiOH etc.) which is used in compounding the positive active material of this invention, adjusting suitably is desirable, checking the presentation of an end product. For example, it is good to the target positive-active-material presentation ratio also considering the amount of said lithium salt as increase of 1 - 2 percent.

[0069] (Example 1) - production Mn<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O of Li<sub>1.0</sub>Mn<sub>0.35</sub>Nickel<sub>0.42</sub>Co<sub>0.23</sub>O<sub>2</sub> by the coprecipitation method -- nickel<sub>2</sub>O<sub>3</sub>, H<sub>2</sub>O, and Co<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O are measured, respectively so that it may become the element ratio of Mn:nickel:Co=0.35:0.42:0.23. Dropping mixing was carried out holding pH for the hydrochloric-acid water solution of the hydrochloric-acid water solution of said Mn<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O, said nickel<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, and Co<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O at a room temperature in the sodium-hydroxide water solution of 0.1 mol/l 11, respectively, and - washing classified by \*\* of a precipitate product was done. Next, the positive active material of the presentation shown by Li<sub>1.0</sub>Mn<sub>0.35</sub>Nickel<sub>0.42</sub>Co<sub>0.23</sub>O<sub>2</sub> was obtained by heat-treating said quality of sediment and lithium-hydroxide water solution at 1000 degrees C continuously by 400 degrees C under an oxygen ambient atmosphere for 5 hours for 5 hours, after carrying out sinking-in mixing so that it may become the element ratio of Li:nickel:Mn=1:0.35:0.42:0.23.

[0070] (Example 2) - Li<sub>1.0</sub>Mn<sub>0.35</sub>Nickel<sub>0.42</sub> by the powder-mixing method -- water was made to suspend so that it may become the element ratio of Li:Mn:nickel:Co=1:0.35:0.42:0.23, wet grinding was carried out and Production LiOH, and Mn<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O of Co<sub>0.23</sub>O<sub>2</sub>, nickel<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, and Co<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O were slurred so that all particle diameter might be set to less than 1 micrometer. After drying the obtained slurry, the positive active material of the presentation shown by Li<sub>1.0</sub>Mn<sub>0.35</sub>Nickel<sub>0.42</sub>Co<sub>0.23</sub>O<sub>2</sub> was obtained by heat-treating at 1000 degrees C continuously by 400 degrees C for 5 hours for 5 hours.

[0071] (Example 3) - the boron addition LiOH, Mn<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, nickel<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, Co<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, and B-2 O<sub>3</sub> -- Li:Mn:nickel:Co:B= -- water was made to suspend so that it may become the element ratio of 1:0.35:0.42:0.23:0.001, and wet grinding was carried out and it slurred so that all particle diameter might be set to less than 1 micrometer. After drying the obtained slurry, the positive active material of the presentation shown by Li<sub>1.0</sub>Mn<sub>0.35</sub>Nickel<sub>0.42</sub>Co<sub>0.23</sub>O<sub>2</sub> was obtained by heat-treating at 1000 degrees C continuously by 400 degrees C for 5 hours for 5 hours.

[0072] (Example 4) - water was made to suspend so that it may become the element ratio of Li:Mn:nickel:Co=1:0.35:0.42:0.23, wet grinding was carried out and the 1100-degree-C heat treatment LiOH, Mn<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, nickel<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, and Co<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O were slurred so that all particle diameter might be set to less than 1 micrometer. After drying the obtained slurry, the positive active material of the presentation shown by Li1.0Mn0.35nickel0.42Co 0.23O<sub>2</sub> was obtained by heat-treating at 1100 degrees C continuously by 400 degrees C for 5 hours for 5 hours.

[0073] (Example 5) - water was made to suspend so that it may become the element ratio of Li:Mn:nickel:Co=1:0.35:0.42:0.23, wet grinding was carried out and the 950-degree-C heat treatment LiOH, Mn<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, nickel<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, and Co<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O were slurred so that all particle diameter might be set to less than 1 micrometer. After drying the obtained slurry, the positive active material of the presentation shown by Li1.0Mn0.35nickel0.42Co 0.23O<sub>2</sub> was obtained by heat-treating at 950 degrees C continuously by 400 degrees C for 5 hours for 5 hours.

[0074] (Example 6) Water was made to suspend so that it may become the element ratio of Li:Mn:nickel=1:0.45:0.55, wet grinding was carried out and LiOH, Mn<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, and nickel<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O were slurred so that all particle diameter might be set to less than 1 micrometer. After drying the obtained slurry, the positive active material of the presentation shown with Li1.0Mn0.45nickel 0.55O<sub>2</sub> was obtained by heat-treating at 1000 degrees C continuously by 400 degrees C for 5 hours for 5 hours.

[0075] (Example 7) Water was made to suspend so that it may become the element ratio of Li:Mn:nickel=1:0.5:0.5, wet grinding was carried out and LiOH, Mn<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, and nickel<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O were slurred so that all particle diameter might be set to less than 1 micrometer. After drying the obtained slurry, the positive active material of the presentation shown with Li1.0Mn0.5nickel 0.5O<sub>2</sub> was obtained by heat-treating at 1000 degrees C continuously by 400 degrees C for 5 hours for 5 hours.

[0076] (Example 8) Water was made to suspend so that it may become the element ratio of Li:Mn:nickel:Co=1:0.3:0.3:0.4, wet grinding was carried out and LiOH, Mn<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, nickel<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, and Co<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O were slurred so that all particle diameter might be set to less than 1 micrometer. After drying the obtained slurry, the positive active material of the presentation shown by Li1.0Mn0.3nickel0.3Co 0.4O<sub>2</sub> was obtained by heat-treating at 1000 degrees C continuously by 400 degrees C for 5 hours for 5 hours.

[0077] (Example 9) Water was made to suspend so that it may become the element ratio of Li:Mn:nickel:Co=1:0.25:0.4:0.35, wet grinding was carried out and LiOH, Mn<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, nickel<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, and Co<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O were slurred so that all particle diameter might be set to less than 1 micrometer. After drying the obtained slurry, the positive active material of the presentation shown by Li1.0Mn0.25nickel0.4Co 0.35O<sub>2</sub> was obtained by heat-treating at 1000 degrees C continuously by 400 degrees C for 5 hours for 5 hours.

[0078] (Example 1 of a comparison) - water was made to suspend so that it may become the element ratio of Li:Mn:nickel:Co=1:0.35:0.42:0.23, wet grinding was carried out and the 1200-degree-C heat treatment LiOH, Mn<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, nickel<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, and Co<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O were slurred so that all particle diameter might be set to less than 1 micrometer. After drying the obtained slurry, the positive active material of the presentation shown by Li1.0Mn0.35nickel0.42Co 0.23O<sub>2</sub> was obtained by heat-treating at 1200 degrees C continuously by 400 degrees C for 5 hours for 5 hours.

[0079] (Example 2 of a comparison) - water was made to suspend so that it may become the element ratio of Li:Mn:nickel:Co=1:0.35:0.42:0.23, wet grinding was carried out and the 900-degree-C heat treatment LiOH, Mn<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, nickel<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, and Co<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O were slurred so that all particle diameter might be set to less than 1 micrometer. After drying the obtained slurry, the positive active material of the presentation shown by Li1.0Mn0.35nickel0.42Co 0.23O<sub>2</sub> was obtained by heat-treating at 900 degrees C continuously by 400 degrees C for 5 hours for 5 hours.

[0080] (Example 3 of a comparison) - water was made to suspend so that it may become the element ratio of Li:Mn:nickel:Co=1:0.35:0.42:0.23, wet grinding was carried out and the 750-degree-C heat treatment LiOH, Mn<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, nickel<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, and Co<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O were slurred so that all particle diameter might be set to less than 1 micrometer. After drying the obtained slurry, the positive active material of the presentation shown by Li1.0Mn0.35nickel0.42Co 0.23O<sub>2</sub> was obtained by heat-

treating at 750 degrees C continuously by 400 degrees C for 5 hours for 5 hours.

[0081] (Example 4 of a comparison) Measuring Mn (NO<sub>3</sub>)<sub>2</sub>, nickel (NO<sub>3</sub>)<sub>2</sub>, and Co (NO<sub>3</sub>)<sub>2</sub>, respectively so that it might become the element ratio of Mn:nickel:Co=0.35:0.42:0.23, subsequent processes obtained the positive active material of the presentation shown by Li1.0Mn0.35nickel0.42Co 0.23O<sub>2</sub> by the coprecipitation method like the example 1.

[0082] (Example 5 of a comparison) Measuring Mn (NO<sub>3</sub>)<sub>2</sub>, nickel<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, and Co(NO<sub>3</sub>)<sub>2</sub>, respectively so that it might become the element ratio of Mn:nickel:Co=0.35:0.42:0.23, subsequent processes obtained the positive active material of the presentation shown by Li1.0Mn0.35nickel0.42Co 0.23O<sub>2</sub> by the coprecipitation method like the example 1.

[0083] (Example 6 of a comparison) Measuring Mn<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, and nickel (NO<sub>3</sub>)<sub>2</sub> and Co (NO<sub>3</sub>)<sub>2</sub>, respectively so that it might become the element ratio of Mn:nickel:Co=0.35:0.42:0.23, subsequent processes obtained the positive active material of the presentation shown by Li1.0Mn0.35nickel0.42Co 0.23O<sub>2</sub> by the coprecipitation method like the example 1.

[0084] (Example 7 of a comparison) Measuring Co<sub>2</sub>O<sub>3</sub> and Mn (NO<sub>3</sub>)<sub>2</sub>, nickel (NO<sub>3</sub>)<sub>2</sub>, and H<sub>2</sub>O, respectively so that it might become the element ratio of Mn:nickel:Co=0.35:0.42:0.23, subsequent processes obtained the positive active material of the presentation shown by Li1.0Mn0.35nickel0.42Co 0.23O<sub>2</sub> by the coprecipitation method like the example 1.

[0085] (Example 8 of a comparison) Water was made to suspend so that it may become the element ratio of Li:Mn:nickel:Co:B=1:0.35:0.42:0.23:0.001, wet grinding was carried out and LiOH, Mn<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, NiO and CoO, and B-2 O<sub>3</sub> were slurred so that all particle diameter might be set to less than 1 micrometer. Subsequent processes obtained the positive active material of the presentation shown by Li1.0Mn0.35nickel0.42Co 0.23O<sub>2</sub> by the powder-mixing method like the example 2.

[0086] (Example 9 of a comparison) Water was made to suspend so that it may become the element ratio of Li:Mn:nickel:Co:B=1:0.35:0.42:0.23:0.001, wet grinding was carried out and LiOH, MnO<sub>2</sub>, nickel<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O, CoO, and B-2 O<sub>3</sub> were slurred so that all particle diameter might be set to less than 1 micrometer. Subsequent processes obtained the positive active material of the presentation shown by Li1.0Mn0.35nickel0.42Co 0.23O<sub>2</sub> by the powder-mixing method like the example 2.

[0087] (Example 10 of a comparison) Water was made to suspend so that it may become the element ratio of Li:Mn:nickel:Co:B=1:0.35:0.42:0.23:0.001, wet grinding was carried out and LiOH, MnO<sub>2</sub> and NiO, Co<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, and B-2 O<sub>3</sub> were slurred so that all particle diameter might be set to less than 1 micrometer. Subsequent processes obtained the positive active material of the presentation shown by Li1.0Mn0.35nickel0.42Co 0.23O<sub>2</sub> by the powder-mixing method like the example 2.

[0088] (Example 11 of a comparison) Water was made to suspend so that it may become the element ratio of Li:Mn:nickel=1:0.55:0.45, wet grinding was carried out and LiOH, Mn<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, and nickel<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O were slurred so that all particle diameter might be set to less than 1 micrometer. After drying the obtained slurry, the positive active material of the presentation shown with Li1.0Mn0.25nickel 0.75O<sub>2</sub> was obtained by heat-treating at 1000 degrees C continuously by 400 degrees C for 5 hours for 5 hours.

[0089] (Example 12 of a comparison) Water was made to suspend so that it may become the element ratio of Li:Mn:nickel=1:0.25:0.75, wet grinding was carried out and LiOH, Mn<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, and nickel<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O were slurred so that all particle diameter might be set to less than 1 micrometer. After drying the obtained slurry, the positive active material of the presentation shown with Li1.0Mn0.4nickel 0.6O<sub>2</sub> was obtained by heat-treating at 1000 degrees C continuously by 400 degrees C for 5 hours for 5 hours.

[0090] (Example 13 of a comparison) Water was made to suspend so that it may become the element ratio of Li:Mn:nickel:Co=1:0.25:0.3:0.45, wet grinding was carried out and LiOH, Mn<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, nickel<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, and Co<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O were slurred so that all particle diameter might be set to less than 1 micrometer. After drying the obtained slurry, the positive active material of the presentation shown by Li1.0Mn0.25nickel0.3Co 0.45O<sub>2</sub> was obtained by heat-treating at 1000 degrees C continuously by 400 degrees C for 5 hours for 5 hours.

[0091] (Example 14 of a comparison) Water was made to suspend so that it may become the element

ratio of Li:Mn:nickel:Co=1:0.25:0.5:0.25, wet grinding was carried out and LiOH, Mn<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, nickel<sub>2</sub>O<sub>3</sub>andH<sub>2</sub>O, and Co<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O were slurred so that all particle diameter might be set to less than 1 micrometer. After drying the obtained slurry, the positive active material of the presentation shown by Li1.0Mn0.25nickel0.4Co 0.35O<sub>2</sub> was obtained by heat-treating at 1000 degrees C continuously by 400 degrees C for 5 hours for 5 hours.

[0092] The multiple oxide compounded by the above-mentioned example and the example of a comparison by drawing 2 is shown on a 3 yuan state diagram. O The mark is based on the above-mentioned example and - mark is based on the above-mentioned example of a comparison.

[0093] (this invention cells 1-9 and comparison cells 1-14) The polyvinylidene fluoride (PVdF) which are the positive active material compounded as mentioned above, the acetylene black which is an electric conduction agent, and a binder was mixed at a rate of the weight ratio 85:10:5, and the N-methyl-2-pyrrolidone (NMP) was added, it kneaded enough, and the positive-electrode paste was obtained. After having applied said positive-electrode paste to one field on an aluminium foil charge collector with a thickness of 20 micrometers, applying like the field of another side after air drying in about 25-degree C ordinary temperature and drying at 130 degrees C under reduced pressure for 12 hours, press working of sheet metal was carried out, and it judged to the discoid of 2 1cm, and considered as the positive electrode 1.

[0094] The artificial graphite (magnitude (Lc)55nm of the microcrystal of the mean particle diameter of 6 micrometers, 0.337nm (d002) of spacings by the X-ray diffraction method, and the direction of a c-axis) and polyvinylidene fluoride (PVdF) which are a negative-electrode ingredient were mixed at a rate of the weight ratio 95:5, and the N-methyl-2-pyrrolidone (NMP) was added, it kneaded enough, and the negative-electrode paste was obtained. Next, after having applied said negative-electrode paste to one field of electrolytic copper foil with a copper foil charge collector with a thickness of 15 micrometers top thickness of 12 micrometers, applying like the field of another side after air drying in about 25-degree C ordinary temperature and drying at 130 degrees C under reduced pressure for 12 hours, press working of sheet metal was carried out, and it judged to the discoid of 2 1cm, and considered as the negative electrode 2.

[0095] LiPF<sub>6</sub> which is a fluorine-containing electrolyte salt was dissolved in the mixed solvent which mixed ethylene carbonate and diethyl carbonate at a rate of a volume ratio 1:1 by the concentration of 1 mol/l, and nonaqueous electrolyte was created. The moisture content in said electrolyte was set to less than 20 ppm.

[0096] The dew-point produced the coin mold nonaqueous electrolyte cell under the desiccation ambient atmosphere -50 degrees C or less using the member mentioned above. The positive electrode 1 was stuck by pressure and used for the positive-electrode can 4 to which the positive-electrode charge collector 6 was attached. The negative electrode 2 was stuck by pressure and used for the negative-electrode can 5 to which the negative-electrode charge collector 7 was attached. The coin mold lithium secondary battery with a diameter [ of 20mm ] and a thickness of 1.6mm shown in drawing 1 using the above-mentioned positive electrode 1, a negative electrode 2, an electrolyte, and a separator 3 was produced. 8 is insulating packing. As positive active material, it considers as this invention cells 1-9 and the comparison cells 1-14 using Li1.0Mn0.35nickel0.42Co 0.23O<sub>2</sub> obtained in examples 1-9 and the examples 1-14 of a comparison, respectively.

[0097] (Cycle trial) Many said this invention cells 1-9 and comparison cells 1-14 are produced, respectively, and it is 10 cycle \*\*\*\*\* about initial charge and discharge. Making the charge conditions at this time into current 0.1ItA (rate of 10 time amount), and the constant current constant-potential charge of 4.2V, discharge conditions made current 0.1ItA (rate of 10 time amount), and a termination electrical potential difference the constant-current discharge of 3.0V.

[0098] Then, the cycle trial was performed. Making the charge conditions of this cycle trial into 1.0ItA (rate of 1 time amount), and the constant current constant-potential charge of 4.2V, discharge conditions made current 1.0ItA (rate of 1 time amount), and a termination electrical potential difference the constant-current discharge of 3.0V.

[0099] The charge and discharge test result of this invention cells 1-9 and the comparison cells 1-14 was

indicated to Table 1.

[0100]

[Table 1]

電池名	製造条件			複合酸化物組成		初期放電容量 mAh/g	電池性能 30サイクル後 放電容量 mAh/g
	製造法	熱処理温度	その他	組成			
本発明電池 1	共沈	1000°C		LiMn <sub>0.35</sub> Ni <sub>0.42</sub> Co <sub>0.23</sub> O <sub>2</sub>	"	160	160
本発明電池 2	湿式混合	1000°C				160	160
本発明電池 3	"	"	ホウ素添加	"	"	160	160
本発明電池 4	"	1100°C		"	"	160	160
本発明電池 5	"	950°C		"	"	159	151
本発明電池 6	"	1000°C		LiMn <sub>0.45</sub> Ni <sub>0.55</sub> O <sub>2</sub>		155	154
本発明電池 7	"	"		LiMn <sub>0.5</sub> Ni <sub>0.5</sub> O <sub>2</sub>		150	150
本発明電池 8	"	"		LiMn <sub>0.3</sub> Ni <sub>0.3</sub> Co <sub>0.4</sub> O <sub>2</sub>		160	160
本発明電池 9	"	"		LiMn <sub>0.25</sub> Ni <sub>0.4</sub> Co <sub>0.35</sub> O <sub>2</sub>		160	160
比較電池 1	"	1200°C		"	"	130	130
比較電池 2	"	900°C		"	"	155	145
比較電池 3	"	750°C		"	"	150	143
比較電池 4	共沈	1000°C	2面原料使用	LiMn <sub>0.35</sub> Ni <sub>0.42</sub> Co <sub>0.23</sub> O <sub>2</sub>		150	80
比較電池 5	"	"	"	"	"	150	120
比較電池 6	"	"	"	"	"	150	80
比較電池 7	"	"	"	"	"	150	100
比較電池 8	湿式混合	"		"	"	150	130
比較電池 9	"	"		"	"	150	100
比較電池 10	"	"		"	"	140	80
比較電池 11	"	"		LiMn <sub>0.65</sub> Ni <sub>0.45</sub> O <sub>2</sub>		120	100
比較電池 12	"	"		LiMn <sub>0.25</sub> Ni <sub>0.75</sub> O <sub>2</sub>		160	130
比較電池 13	"	"		LiMn <sub>0.25</sub> Ni <sub>0.3</sub> Co <sub>0.45</sub> O <sub>2</sub>		145	140
比較電池 14	"	"		LiMn <sub>0.25</sub> Ni <sub>0.5</sub> Co <sub>0.25</sub> O <sub>2</sub>		160	145

By this invention cells 1-5 using the positive active material of the examples 1-5 which used the trivalent transition-metals compound for the raw material, set the presentation to Li<sub>1.0</sub>Mn<sub>0.35</sub>Ni<sub>0.42</sub>Co<sub>0.23</sub>O<sub>2</sub>, and made heat treatment temperature 950-1100 degrees C, it was not based on the manufacture approach but the very good cell engine performance was shown. That is, the good cycle engine performance if this invention cell 5 is removed after 30 cycle \*\*\*\*\*\*, until discharge capacity is very as high as 160 mAh/g, and discharge capacity does not fall to a further very surprising thing at all and it is hard being said to it that repeat charge and discharge are believed was checked.

[0101] On the other hand, by the comparison cell 1 using the positive active material of the example 1 of a comparison which made heat treatment temperature 1200 degrees C, a result to which discharge

capacity falls greatly compared with said this invention cells 1-3 was brought. The desorption of the lithium used for the raw material happens during heat treatment, and since the amount of lithiums in which charge and discharge are possible decreased, this is considered.

[0102] By the comparison cells 2 and 3 using the positive active material of the examples 2 and 3 of a comparison which made heat treatment temperature less than 950 degrees C, the fall of discharge capacity was checked too. Although it is not necessarily clear about this cause, since the colors of an active material differ as described above, possibility of being what is different from the positive active material of an example at a certain point is high.

[0103] By having examined the example and the example of a comparison which changed the ratio of the transition-metals element which constitutes positive active material, the element ratio of Mn brought a result especially with a low discharge capacity [ else ] by this invention cell 11 using the positive active material of the example 11 of a comparison made into the presentation ratio exceeding 0.5 among transition-metals elements. As a result of examining this ingredient further, it turned out that it has the spinel crystal structure.

[0104] By the comparison cells 4-10 using the positive active material of the examples 4-10 of a comparison which heat-treated the mixture which contains a divalent transition-metals compound in a raw material, and were acquired, the result which is not good was given.

[0105] The cell engine performance brought a result for which does not depend for on the creating methods, such as a coprecipitation method and powder mixing, but it depends on the oxidation number of a start raw material greatly from this result. Although the cycle engine performance of the comparison cells 4-10 is not necessarily clear as a cause which is not good, in a heat treatment process, trivalent change of a divalent transition-metals compound raw material is not performed smoothly, but the divalent transition-metals element which remains produces distortion of the crystal structure, and collapse of structure, and that to which the charge and discharge in the 4V neighborhood worsened especially is presumed.

[0106] In addition, in this example, although illustrated about the carbon button mold cell, the effectiveness of this invention is not limited to a cell configuration, and when the winding type electrode was used [ for example, ] as the generation-of-electrical-energy element, or even when a cell configuration is made cylindrical, the same result is completely obtained.

[0107]

[Effect of the Invention] Since it is as having mentioned above according to this invention, the rechargeable battery using the manufacture approach of the positive active material for rechargeable batteries with high energy density and good repeat charge/discharge capability ability and it can be offered.

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[Translation done.]

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=> s (0.9-1.3)/Li and (0.025-0.45)/Ni and (0.1-0.95)/Co and (0.025-0.45)/Mn and (2)/O  
105564 (0.9-1.3)/LI  
13681 (0.025-0.45)/NI  
17048 (0.1-0.95)/CO  
13669 (0.025-0.45)/MN  
6174692 (2)/O  
L1 686 (0.9-1.3)/LI AND (0.025-0.45)/NI AND (0.1-0.95)/CO AND (0.025-0.45)/MN AND (2)/O

=> file caplus  
COST IN U.S. DOLLARS  
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SINCE FILE ENTRY	TOTAL SESSION
25.65	25.86

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COST IN U.S. DOLLARS

	SINCE FILE ENTRY	TOTAL SESSION
FULL ESTIMATED COST	5.40	31.73

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=> s 11 and 12  
600 L1  
20938 L2  
L3 8 L1 AND L2

=> d 13 1-8 ibib

L3 ANSWER 1 OF 8 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2006:1357031 CAPLUS  
DOCUMENT NUMBER: 146:103984  
TITLE: Cathode active material added with fluorine compound  
for lithium secondary batteries and method of  
producing thereof  
INVENTOR(S): Sun, Yang Kook; Han, Jung Min  
PATENT ASSIGNEE(S): Daejung Chemicals & Metals Co., Ltd., S. Korea  
SOURCE: PCT Int. Appl., 56pp.  
CODEN: PIXXD2  
DOCUMENT TYPE: Patent  
LANGUAGE: English  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2006137673	A1	20061228	WO 2006-KR2362	20060620
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW				
RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG, BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				

PRIORITY APPLN. INFO.: KR 2005-53304 A 20050621  
REFERENCE COUNT: 2 THERE ARE 2 CITED REFERENCES AVAILABLE FOR THIS  
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L3 ANSWER 2 OF 8 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2006:1018272 CAPLUS  
DOCUMENT NUMBER: 146:10555  
TITLE: Preparation, morphology and electrochemical  
characteristics of LiNi<sub>1</sub>/3Mn<sub>1</sub>/3Co<sub>1</sub>/3O<sub>2</sub> with LiF  
addition  
AUTHOR(S): Li, Decheng; Sasaki, Yuki; Kobayakawa, Koichi;  
Noguchi, Hideyuki; Sato, Yuichi  
CORPORATE SOURCE: High-Tech Research Center, Kanagawa University, 1-1-40  
Suehiromachi, Tsurumi-ku, Yokohama, 230-0045, Japan  
SOURCE: Electrochimica Acta (2006), 52(2), 643-648  
CODEN: ELCAAV; ISSN: 0013-4686  
PUBLISHER: Elsevier B.V.  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
REFERENCE COUNT: 20 THERE ARE 20 CITED REFERENCES AVAILABLE FOR THIS  
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L3 ANSWER 3 OF 8 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2006:977382 CAPLUS  
 DOCUMENT NUMBER: 145:360086  
 TITLE: Nonaqueous electrolytes for lithium ion batteries  
 INVENTOR(S): Chen, Zonghai; Amine, Khalil  
 PATENT ASSIGNEE(S): The University of Chicago, USA  
 SOURCE: U.S. Pat. Appl. Publ., 20pp.  
 CODEN: USXXCO  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

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US 2006210883	A1	20060921	US 2006-373054	20060310
WO 2006101779	A2	20060928	WO 2006-US8664	20060310
WO 2006101779	A3	20070322		
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW				
RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG, BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				

PRIORITY APPLN. INFO.: US 2005-662056P P 20050315  
 OTHER SOURCE(S): MARPAT 145:360086

L3 ANSWER 4 OF 8 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2006:116858 CAPLUS  
 DOCUMENT NUMBER: 144:174334  
 TITLE: Manufacture of manganese based cathode active mass and its usage  
 INVENTOR(S): Sun, Yucheng; Chen, Liquan; Huang, Xuejie  
 PATENT ASSIGNEE(S): Institute of Physics, Chinese Academy of Sciences, Peop. Rep. China  
 SOURCE: Faming Zhuanli Shenqing Gongkai Shuomingshu, 18 pp.  
 CODEN: CNXXEV  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Chinese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 1595689	A	20050316	CN 2003-156807	20030908
PRIORITY APPLN. INFO.:			CN 2003-156807	20030908

L3 ANSWER 5 OF 8 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2005:1090537 CAPLUS  
 DOCUMENT NUMBER: 145:30728  
 TITLE: Effect of Fluorine on the Electrochemical Properties of Layered  $\text{Li}[\text{Ni}_{0.43}\text{Co}_{0.22}\text{Mn}_{0.35}]_{\text{O}_2}$  Cathode Materials via a Carbonate Process  
 AUTHOR(S): Shin, Ho-Suk; Park, Sang-Ho; Yoon, Chong-Seung; Sun, Yang-Kook  
 CORPORATE SOURCE: Department of Chemical Engineering, Center for Information and Communication, Division of Advanced

SOURCE: Materials Science, Hanyang University, Seoul, S. Korea  
Electrochemical and Solid-State Letters (2005), 8(11),  
A559-A563  
CODEN: ESLEF6; ISSN: 1099-0062  
PUBLISHER: Electrochemical Society  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
REFERENCE COUNT: 20 THERE ARE 20 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L3 ANSWER 6 OF 8 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2004:848448 CAPLUS  
DOCUMENT NUMBER: 142:15692  
TITLE: Synthesis of Li[Ni<sub>1/3</sub>Co<sub>1/3</sub>Mn<sub>1/3</sub>]O<sub>2-z</sub>F<sub>z</sub> via coprecipitation  
AUTHOR(S): Myung, Seung-Taek; Kim, Gil-Ho; Sun, Yang-Kook  
CORPORATE SOURCE: VK Corporation, Pyongtaek, 450-090, S. Korea  
SOURCE: Chemistry Letters (2004), 33(10), 1388-1389  
CODEN: CMLTAG; ISSN: 0366-7022  
PUBLISHER: Chemical Society of Japan  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
REFERENCE COUNT: 14 THERE ARE 14 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L3 ANSWER 7 OF 8 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2004:833681 CAPLUS  
DOCUMENT NUMBER: 142:25771  
TITLE: Influence of LiF Additions on Li[Ni<sub>x</sub>Co<sub>1-2x</sub>Mn<sub>x</sub>]O<sub>2</sub> Materials  
AUTHOR(S): Jouanneau, S.; Dahn, J. R.  
CORPORATE SOURCE: Department of Physics and Atmospheric Science,  
Dalhousie University, Halifax, NS, B3H 3J5, Can.  
SOURCE: Journal of the Electrochemical Society (2004),  
151(10), A1749-A1754  
CODEN: JESOAN; ISSN: 0013-4651  
PUBLISHER: Electrochemical Society  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
REFERENCE COUNT: 24 THERE ARE 24 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L3 ANSWER 8 OF 8 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2004:392154 CAPLUS  
DOCUMENT NUMBER: 140:393378  
TITLE: Layered cathode materials for lithium ion rechargeable batteries  
INVENTOR(S): Kang, Sun-ho; Amine, Khalil  
PATENT ASSIGNEE(S): The University of Chicago, USA  
SOURCE: U.S. Pat. Appl. Publ., 24 pp.  
CODEN: USXXCO  
DOCUMENT TYPE: Patent  
LANGUAGE: English  
FAMILY ACC. NUM. COUNT: 2  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2004091779	A1	20040513	US 2003-699484	20031031
US 7205072	B2	20070417		
US 2005058588	A1	20050317	US 2004-903514	20040730
PRIORITY APPLN. INFO.:			US 2002-423347P	P 20021101 ✓
			US 2003-699484	A2 20031031

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600 L1  
235740 BORON  
L4 23 L1 AND BORON

=> s 14 not 13  
L5 23 L4 NOT L3

=> d 15 1-23 ibib

L5 ANSWER 1 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2007:117698 CAPLUS  
DOCUMENT NUMBER: 146:209722  
TITLE: Battery  
INVENTOR(S): Obana, Yoshiaki; Tokunaga, Takashi; Akashi, Hiroyuki  
PATENT ASSIGNEE(S): Sony Corporation, Japan  
SOURCE: U.S. Pat. Appl. Publ., 21pp.  
CODEN: USXXCO  
DOCUMENT TYPE: Patent  
LANGUAGE: English  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2007026311	A1	20070201	US 2006-459514	20060724
JP 2007059379	A	20070308	JP 2006-141036	20060522
CN 1917276	A	20070221	CN 2006-10136308	20060731
PRIORITY APPLN. INFO.:			JP 2005-222195	A 20050729
			JP 2006-141036	A 20060522

L5 ANSWER 2 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2007:116810 CAPLUS  
DOCUMENT NUMBER: 146:209709  
TITLE: Lithium cobalt mixed oxide cathode active materials,  
method for their manufacture, and batteries  
INVENTOR(S): Morita, Koji; Soma, Masanori; Watanabe, Haruo  
PATENT ASSIGNEE(S): Sony Corp., Japan  
SOURCE: Jpn. Kokai Tokkyo Koho, 22pp.  
CODEN: JKXXAF  
DOCUMENT TYPE: Patent  
LANGUAGE: Japanese  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2007026959	A	20070201	JP 2005-209062	20050719
PRIORITY APPLN. INFO.:			JP 2005-209062	20050719

L5 ANSWER 3 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2007:61240 CAPLUS  
DOCUMENT NUMBER: 146:125414  
TITLE: Secondary lithium battery  
INVENTOR(S): Nakura, Kensuke  
PATENT ASSIGNEE(S): Matsushita Electric Industrial Co., Ltd., Japan  
SOURCE: PCT Int. Appl., 37pp.  
CODEN: PIXXD2  
DOCUMENT TYPE: Patent  
LANGUAGE: Japanese  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2007007542	A1	20070118	WO 2006-JP312728	20060626
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN, HR, ID, IL, IN, IS, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW				
RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG, BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
JP 2007018985	A	20070125	JP 2005-202013	20050711
PRIORITY APPLN. INFO.:			JP 2005-202013	A 20050711
REFERENCE COUNT:	2	THERE ARE 2 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT		

L5 ANSWER 4 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2006:1311106 CAPLUS  
 DOCUMENT NUMBER: 146:65735  
 TITLE: Laminated aluminum case-sealed secondary lithium ion batteries having boron-containing oxyalkylene gel electrolytes and manufacture thereof  
 INVENTOR(S): Kono, Kazushige; Kasai, Masahiro; Nishimura, Shin; Iwayasu, Norio; Okumura, Takefumi  
 PATENT ASSIGNEE(S): Hitachi Ltd., Japan  
 SOURCE: Jpn. Kokai Tokkyo Koho, 13pp.  
 CODEN: JKXXAF  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2006339011	A	20061214	JP 2005-161708	20050601
PRIORITY APPLN. INFO.:			JP 2005-161708	20050601

L5 ANSWER 5 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2006:1286174 CAPLUS  
 DOCUMENT NUMBER: 146:47821  
 TITLE: Method of preparation of cathode active material for battery  
 INVENTOR(S): Watanabe, Haruo; Ogisu, Kenji; Morita, Koji; Soma, Masanori; Hosoya, Yosuke; Azuma, Hideto; Ooyama, Tomoyo  
 PATENT ASSIGNEE(S): Sony Corp., Japan  
 SOURCE: U.S. Pat. Appl. Publ., 29pp.  
 CODEN: USXXCO  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2006275667	A1	20061207	US 2006-419863	20060523
JP 2006331940	A	20061207	JP 2005-156030	20050527
JP 2006331941	A	20061207	JP 2005-156031	20050527
JP 2006331943	A	20061207	JP 2005-156033	20050527

CN 1897336	A	20070117	CN 2006-10121255	20060529
PRIORITY APPLN. INFO.:			JP 2005-156030	A 20050527
			JP 2005-156031	A 20050527
			JP 2005-156033	A 20050527

L5 ANSWER 6 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2006:1256691 CAPLUS  
 DOCUMENT NUMBER: 146:30080  
 TITLE: Nonaqueous electrolytic solution for electrochemical cells  
 INVENTOR(S): Xu, Wu; Deng, Zhongyi; Prabhu, Vaikunth S.; Bolomey, Pascal  
 PATENT ASSIGNEE(S): Ferro Corporation, USA  
 SOURCE: PCT Int. Appl., 19pp.  
 CODEN: PIXXD2  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2006127192	A2	20061130	WO 2006-US15294	20060424
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW				
RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG, BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
US 2006269845	A1	20061130	US 2005-138769	20050526
PRIORITY APPLN. INFO.:			US 2005-138769	A 20050526
OTHER SOURCE(S):	MARPAT	146:30080		

L5 ANSWER 7 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2006:1256638 CAPLUS  
 DOCUMENT NUMBER: 146:10718  
 TITLE: Triazine compounds for removing acids and water from nonaqueous electrolytes for electrochemical cells  
 INVENTOR(S): Deng, Zhongyi; Decker, Jerry L.; Xu, Wu; Sans, John R.; Bolomey, Pascal  
 PATENT ASSIGNEE(S): Ferro Corporation, USA  
 SOURCE: U.S. Pat. Appl. Publ., 6pp.  
 CODEN: USXXCO  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2006269844	A1	20061130	US 2005-138907	20050526
PRIORITY APPLN. INFO.:			US 2005-138907	20050526
OTHER SOURCE(S):	MARPAT	146:10718		

L5 ANSWER 8 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2006:1256604 CAPLUS  
 DOCUMENT NUMBER: 146:30076  
 TITLE: Nonaqueous electrolytic solution for electrochemicals

INVENTOR(S): cells  
 Xu, Wu; Deng, Zhongyi; Bolomey, Pascal  
 PATENT ASSIGNEE(S): Ferro Corporation, USA  
 SOURCE: U.S. Pat. Appl. Publ., 10pp.  
 CODEN: USXXCO  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2006269846	A1	20061130	US 2005-138905	20050526
PRIORITY APPLN. INFO.:			US 2005-138905	20050526
OTHER SOURCE(S):	MARPAT 146:30076			

L5 ANSWER 9 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2006:1124068 CAPLUS  
 DOCUMENT NUMBER: 145:457692  
 TITLE: Processes for making dense, spherical active materials  
 for lithium-ion batteries  
 INVENTOR(S): Kang, Sun-Ho; Amine, Khalil  
 PATENT ASSIGNEE(S): The University of Chicago, USA  
 SOURCE: U.S. Pat. Appl. Publ., 20pp.  
 CODEN: USXXCO  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2006239883	A1	20061026	US 2006-410757	20060425
WO 2006116251	A2	20061102	WO 2006-US15379	20060425
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW				
RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG, BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
PRIORITY APPLN. INFO.:			US 2005-674894P	P 20050426

L5 ANSWER 10 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2006:790600 CAPLUS  
 DOCUMENT NUMBER: 145:214331  
 TITLE: Secondary nonaqueous electrolyte battery  
 INVENTOR(S): Murai, Tetsuya  
 PATENT ASSIGNEE(S): Sanyo Electric Co., Ltd., Japan; Sanyo Gs Soft Energy  
 Co., Ltd.  
 SOURCE: PCT Int. Appl., 73pp.  
 CODEN: PIXXD2  
 DOCUMENT TYPE: Patent  
 LANGUAGE: • Japanese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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WO 2006082912	A1	20060810	WO 2006-JP301830	20060203
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW	RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG, BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM			
JP 2006216378	A	20060817	JP 2005-27977	20050203
PRIORITY APPLN. INFO.:			JP 2005-27977	A 20050203
REFERENCE COUNT:	30	THERE ARE 30 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT		

L5 ANSWER 11 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER:

2006:655222 CAPLUS

DOCUMENT NUMBER:

145:106870

TITLE:

Lithium-ion secondary battery

INVENTOR(S):

Lampe-Onnerud, Christina M.

PATENT ASSIGNEE(S):

Boston-Power, Inc., USA

SOURCE:

PCT Int. Appl., 58 pp.

CODEN: PIXXD2

DOCUMENT TYPE:

Patent

LANGUAGE:

English

FAMILY ACC. NUM. COUNT: 2

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2006071972	A2	20060706	WO 2005-US47383	20051223
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW	RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG, BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM			
US 2007026315	A1	20070201	US 2006-485068	20060712
PRIORITY APPLN. INFO.:			US 2004-639275P	P 20041228
			US 2005-680271P	P 20050512
			US 2005-699285P	P 20050714
			WO 2005-US47383	A2 20051223
			US 2006-474056	A2 20060623

L5 ANSWER 12 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER:

2006:457389 CAPLUS

DOCUMENT NUMBER:

144:491841

TITLE:

Method for preparing manganese-containing multi-metal oxide as anode material of lithium ion battery

INVENTOR(S):

Fang, Songsheng; Lin, Yunqing; Wang, Shoufeng; Chen, Zewei; Zeng, Pengcheng

PATENT ASSIGNEE(S):

Shenzhen Bak Battery Co., Ltd., Peop. Rep. China

SOURCE:

Faming Zhanli Shenqing Gongkai Shuomingshu, 14 pp.

CODEN: CNXXEV

DOCUMENT TYPE:

Patent

LANGUAGE: Chinese  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 1770513	A	20060510	CN 2004-10081223	20041103
PRIORITY APPLN. INFO.:			CN 2004-10081223	20041103

L5 ANSWER 13 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2005:1193762 CAPLUS  
DOCUMENT NUMBER: 143:463102  
TITLE: Chlorine-containing electrolytes, chlorine compound-coated anodes, and secondary batteries  
INVENTOR(S): Kawashima, Atsumichi  
PATENT ASSIGNEE(S): Sony Corp., Japan  
SOURCE: Jpn. Kokai Tokkyo Koho, 29 pp.  
CODEN: JKXXAF  
DOCUMENT TYPE: Patent  
LANGUAGE: Japanese  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2005317399	A	20051110	JP 2004-134778	20040428
PRIORITY APPLN. INFO.:			JP 2004-134778	20040428

L5 ANSWER 14 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2005:527234 CAPLUS  
DOCUMENT NUMBER: 143:46098  
TITLE: Materials and methods of fabrication of cathodes of lithium ion batteries  
INVENTOR(S): Liu, Huiquan; Zhou, Xinying  
PATENT ASSIGNEE(S): BYD America Corporation, Peop. Rep. China  
SOURCE: U.S. Pat. Appl. Publ., 11 pp., Cont.-in-part of U.S. Ser. No. 918,580.  
CODEN: USXXCO  
DOCUMENT TYPE: Patent  
LANGUAGE: English  
FAMILY ACC. NUM. COUNT: 7  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2005130042	A1	20050616	US 2004-10041	20041210
CN 1627550	A	20050615	CN 2003-10112600	20031211
US 2004191161	A1	20040930	US 2004-823931	20040414
US 2004223906	A1	20041111	US 2004-841760	20040508
US 2005037263	A1	20050217	US 2004-918580	20040813
PRIORITY APPLN. INFO.:			CN 2003-10112600	A 20031211
			US 2004-823931	A2 20040414
			US 2004-841760	A2 20040508
			US 2004-918580	A2 20040813
			CN 2002-151991	A 20021119
			CN 2002-156241	A 20021210
			CN 2003-114242	A 20030414
			CN 2003-126555	A 20030509
			CN 2003-139607	A 20030623
			CN 2003-140196	A 20030815
			CN 2003-140216	A 20030815
			US 2003-717236	A2 20031119
			US 2003-733018	A2 20031210
			US 2004-770630	A2 20040202

L5 ANSWER 15 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2005:315697 CAPLUS  
 DOCUMENT NUMBER: 142:358107  
 TITLE: Single-phase metal-doped cobalt lithium manganese  
       nickel oxide as cathodes for lithium secondary  
       batteries  
 INVENTOR(S): Jordy, Christian; Audry, Claudette; Boeuve,  
               Jean-pierre; Biensan, Philippe; Lecerf, Andre  
 PATENT ASSIGNEE(S): Saft, Fr.  
 SOURCE: Eur. Pat. Appl., 15 pp.  
 CODEN: EPXXDW  
 DOCUMENT TYPE: Patent  
 LANGUAGE: French  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1523052	A2	20050413	EP 2004-292397	20041008
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, PL, SK, HR				
FR 2860922	A1	20050415	FR 2003-11866	20031010
US 2005112466	A1	20050526	US 2004-960066	20041008
JP 2005150093	A	20050609	JP 2004-295689	20041008
PRIORITY APPLN. INFO.:			FR 2003-11866	A 20031010

L5 ANSWER 16 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2005:300808 CAPLUS  
 DOCUMENT NUMBER: 142:376498  
 TITLE: Method for regulating terminal voltage of cathode  
       during overdischarge and cathode active material for  
       lithium secondary battery  
 INVENTOR(S): Chang, Sung-kyun; Hong, Seung-tae; Kim, Hyeong-jin;  
               Ryu, Duk-hyun; Goh, Eun-young; Lee, Ho-chun; Jeong,  
               Jun-yong; Yeon, Jin-hee  
 PATENT ASSIGNEE(S): Lg Chem, Ltd., S. Korea  
 SOURCE: PCT Int. Appl., 47 pp.  
 CODEN: PIXXD2  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 3  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2005031892	A2	20050407	WO 2004-KR2461	20040924
WO 2005031892	A3	20050602		
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW				
RW: BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
KR 2005030588	A	20050330	KR 2004-76778	20040924
CN 1745490	A	20060308	CN 2004-80003043	20040924
JP 2006514776	T	20060511	JP 2005-518284	20040924
EP 1665420	A2	20060607	EP 2004-774711	20040924
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT,				

IE, SI, FI, RO, CY, TR, BG, CZ, EE, HU, PL, SK  
 PRIORITY APPLN. INFO.: KR 2003-66865 A 20030926  
                          KR 2003-66866 A 20030926  
                          WO 2004-KR2461 W 20040924

L5 ANSWER 17 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2004:944682 CAPLUS  
 DOCUMENT NUMBER: 142:97317  
 TITLE: Effect of the Sintering Agent, B<sub>2</sub>O<sub>3</sub>, on  
       Li[Ni<sub>x</sub>Co<sub>1-2x</sub>Mn<sub>x</sub>]O<sub>2</sub> Materials  
 AUTHOR(S): Jouanneau, S.; Bahmet, W.; Eberman, K. W.; Krause, L.  
           J.; Dahn, J. R.  
 CORPORATE SOURCE: Department of Physics and Atmospheric Science,  
                   Dalhousie University, Halifax, NS, B3H 3J5, Can.  
 SOURCE: Journal of the Electrochemical Society (2004),  
       151(11), A1789-A1796  
 CODEN: JESOAN; ISSN: 0013-4651  
 PUBLISHER: Electrochemical Society  
 DOCUMENT TYPE: Journal  
 LANGUAGE: English  
 REFERENCE COUNT: 24 THERE ARE 24 CITED REFERENCES AVAILABLE FOR THIS  
                   RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L5 ANSWER 18 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2004:816715 CAPLUS  
 DOCUMENT NUMBER: 141:317217  
 TITLE: Secondary nonaqueous electrolyte battery  
 INVENTOR(S): Fujiwara, Toyoki; Tode, Shingo; Kinoshita, Akira;  
               Fujimoto, Hiroyuki; Takahashi, Yasufumi; Nakane, Ikuo;  
               Fujitani, Shin  
 PATENT ASSIGNEE(S): Sanyo Electric Co., Ltd., Japan  
 SOURCE: Jpn. Kokai Tokkyo Koho, 13 pp.  
 CODEN: JKXXAF  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2004281158	A	20041007	JP 2003-69197	20030314
PRIORITY APPLN. INFO.:			JP 2003-69197	20030314

L5 ANSWER 19 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2004:633118 CAPLUS  
 DOCUMENT NUMBER: 141:126408  
 TITLE: Lithium based electrochemical cell systems with  
       suppression of gas evolution  
 INVENTOR(S): Hyung, Yoo-Eup; Vissers, Donald R.; Amine, Khalil  
 PATENT ASSIGNEE(S): The University of Chicago, USA  
 SOURCE: U.S. Pat. Appl. Publ., 7 pp.  
 CODEN: USXXCO  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2004151951	A1	20040805	US 2003-738400	20031217
PRIORITY APPLN. INFO.:			US 2002-434214P	P 20021217
OTHER SOURCE(S):	MARPAT	141:126408		

L5 ANSWER 20 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2004:513092 CAPLUS  
 DOCUMENT NUMBER: 141:57109  
 TITLE: Cathode composition for rechargeable lithium battery  
 INVENTOR(S): Le, Dinh Ba  
 PATENT ASSIGNEE(S): 3M Innovative Properties Company, USA  
 SOURCE: U.S. Pat. Appl. Publ., 16 pp.  
 CODEN: USXXCO  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2004121234	A1	20040624	US 2002-328563	20021223
CA 2510651	A1	20050203	CA 2003-2510651	20031215
WO 2005011044	A1	20050203	WO 2003-US39747	20031215
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW				
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
AU 2003297936	A1	20050214	AU 2003-297936	20031215
EP 1576688	A1	20050921	EP 2003-797008	20031215
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK				
CN 1729591	A	20060201	CN 2003-80107232	20031215
JP 2006512742	T	20060413	JP 2005-504655	20031215
PRIORITY APPLN. INFO.: US 2002-328563 A 20021223 WO 2003-US39747 W 20031215				

L5 ANSWER 21 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2004:161245 CAPLUS  
 DOCUMENT NUMBER: 140:166823  
 TITLE: Nonaqueous electrolyte secondary battery  
 INVENTOR(S): Hideki, Kitao; Takao, Inoue; Katsunori, Yanagida;  
Naoya, Nakanishi; Atsuhiro, Funahashi; Toshiyuki, Nohma  
 PATENT ASSIGNEE(S): Sanyo Electric Co., Ltd., Japan  
 SOURCE: Eur. Pat. Appl., 11 pp.  
 CODEN: EPXXDW  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1391959	A2	20040225	EP 2003-18837	20030819
EP 1391959	A3	20061213		
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK				
JP 2004139743	A	20040513	JP 2002-297739	20021010
CN 1484336	A	20040324	CN 2003-127549	20030806
KR 2004018154	A	20040302	KR 2003-57443	20030820
US 2004110064	A1	20040610	US 2003-604826	20030820
US 7198871	B2	20070403		
PRIORITY APPLN. INFO.: JP 2002-240610 A 20020821 JP 2002-297739 A 20021010				

LS ANSWER 22 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2003:757157 CAPLUS  
 DOCUMENT NUMBER: 139:263346  
 TITLE: Method for preparing cathode active material for  
       nonaqueous secondary battery  
 INVENTOR(S): Nakane, Kenji; Inukai, Hiroshi  
 PATENT ASSIGNEE(S): Sumitomo Chemical Company, Limited, Japan  
 SOURCE: U.S. Pat. Appl. Publ., 14 pp.  
 CODEN: USXXCO  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2003180620	A1	20030925	US 2003-394049	20030324
EP 1357616	A1	20031029	EP 2003-5413	20030313
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK				
JP 2004006267	A	20040108	JP 2003-77386	20030320
CA 2423051	A1	20030925	CA 2003-2423051	20030321
CN 1447462	A	20031008	CN 2003-107945	20030325
JP 2004152753	A	20040527	JP 2003-350447	20031009
PRIORITY APPLN. INFO.:			JP 2002-82968	A 20020325
			JP 2002-297239	A 20021010

LS ANSWER 23 OF 23 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2002:792791 CAPLUS  
 DOCUMENT NUMBER: 137:281915  
 TITLE: Cathode active mass containing lithium transition  
       metal mixed oxide, its manufacture, and secondary  
       battery using it  
 INVENTOR(S): Shiozaki, Ryuji; Okabe, Kazuya; Yufu, Hiroshi  
 PATENT ASSIGNEE(S): Yuasa Corporation, Japan  
 SOURCE: Jpn. Kokai Tokkyo Koho, 14 pp.  
 CODEN: JKXXAF  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2002304993	A	20021018	JP 2001-106213	20010404
PRIORITY APPLN. INFO.:			JP 2001-106213	20010404

FILE 'HOME' ENTERED AT 13:56:57 ON 07 MAY 2007

=> file reg  
COST IN U.S. DOLLARS  
FULL ESTIMATED COST

SINCE FILE ENTRY	TOTAL SESSION
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DICTIONARY FILE UPDATES: 6 MAY 2007 HIGHEST RN 934336-20-6

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<http://www.cas.org/support/stngen/stndoc/properties.html>

=> s (0.025-0.45)/Ni and (0.1-0.95)/Co and (0.025-0.45)/Mn and (1)/O and (2)/H  
13681 (0.025-0.45)/NI  
17048 (0.1-0.95)/CO  
13669 (0.025-0.45)/MN  
4763349 (1)/O  
389190 (2)/H  
L1 19 (0.025-0.45)/NI AND (0.1-0.95)/CO AND (0.025-0.45)/MN AND (1)/O  
AND (2)/H

=> s LiOH  
L2 2 LIOH

=> s Li<sub>2</sub>CO<sub>3</sub>  
L3 1 LI<sub>2</sub>CO<sub>3</sub>

=> s LiF  
L4 181 LIF

=> s (1)/Li and (1)/F  
105564 (1)/LI  
1427240 (1)/F  
L5 3450 (1)/LI AND (1)/F

=> s B<sub>2</sub>O<sub>3</sub>  
L6 134 B<sub>2</sub>O<sub>3</sub>

=> file caplus  
COST IN U.S. DOLLARS  
FULL ESTIMATED COST

SINCE FILE ENTRY	TOTAL SESSION
56.25	56.46

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FILE COVERS 1907 - 7 May 2007 VOL 146 ISS 20  
FILE LAST UPDATED: 6 May 2007 (20070506/ED)

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<http://www.cas.org/infopolicy.html>

=> s 11  
L7 26 L1

=> s 17 and 12  
7 L2  
L8 0 L7 AND L2

=> s 17 and (LiF or B2O3)  
25881 LiF  
41982 B2O3  
L9 0 L7 AND (LiF OR B2O3)

=> d 17 1-26 ibib kwic

L7 ANSWER 1 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2006:1141205 CAPLUS  
DOCUMENT NUMBER: 145:508521  
TITLE: Method for manufacturing Li<sub>x</sub>C<sub>y</sub>Mn<sub>z</sub>S<sub>n</sub>'O<sub>2</sub> cathode material with improved high power characteristics for lithium ion battery  
INVENTOR(S): He, Xiangming; Li, Jiangang; Jiang, Changyin; Wan, Chunrong; Li, Jianjun; Wang, Li; Ren, Jianguo  
PATENT ASSIGNEE(S): Tsinghua University, Peop. Rep. China  
SOURCE: Faming Zhuanli Shenqing Gongkai Shuomingshu, 6pp.  
CODEN: CNXXEV  
DOCUMENT TYPE: Patent  
LANGUAGE: Chinese  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 1851962	A	20061025	CN 2006-10012015	20060526
PRIORITY APPLN. INFO.:			CN 2006-10012015	20060526
IT 546-89-4, Lithium acetate	553-91-3, Lithium oxalate	554-13-2, Lithium carbonate	556-63-8, Lithium formate	638-39-1, Stannous acetate
814-94-8, Stannous oxalate	919-16-4, Lithium citrate	1310-65-2,		
Lithium hydroxide	2879-85-8, Stannous formate	6493-69-2, Stannous citrate	7790-69-4, Lithium nitrate	13912-55-5 18282-10-5, Stannic oxide
oxide	22755-27-7, Stannous nitrate	499795-33-4, Cobalt		

manganese nickel hydroxide ( $\text{Co}_{0.25}\text{Mn}_{0.38}\text{Ni}_{0.38}(\text{OH})_2$ ) 602297-52-9  
, Cobalt manganese nickel hydroxide ( $\text{Co}_{0.33}\text{Mn}_{0.33}\text{Ni}_{0.33}(\text{OH})_2$ )  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(method for manufacturing  $\text{LiNi}_{x}\text{Co}_{y}\text{Mn}_{z}\text{Sn}_{z'}\text{O}_2$  cathode material with improved  
high power characteristics for lithium ion battery)

IT 915092-23-8P 915092-24-9P  
RL: SPN (Synthetic preparation); TEM (Technical or engineered material  
use); PREP (Preparation); USES (Uses)  
(method for manufacturing  $\text{LiNi}_{x}\text{Co}_{y}\text{Mn}_{z}\text{Sn}_{z'}\text{O}_2$  cathode material with improved  
high power characteristics for lithium ion battery)

IT 390362-04-6P, Cobalt lithium manganese nickel oxide  
( $\text{Co}_{0.25}\text{LiMn}_{0.37}\text{Ni}_{0.37}\text{O}_2$ ) 915092-25-0P 915092-27-2P  
915092-28-3P  
RL: SPN (Synthetic preparation); TEM (Technical or engineered material  
use); PREP (Preparation); USES (Uses)  
(tin-doped, method for manufacturing  $\text{LiNi}_{x}\text{Co}_{y}\text{Mn}_{z}\text{Sn}_{z'}\text{O}_2$  cathode material with  
improved high power characteristics for lithium ion battery)

L7 ANSWER 2 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2006:841445 CAPLUS  
DOCUMENT NUMBER: 146:103788  
TITLE: Synthesis and characterization of  $\text{LiNi}_{0.4}\text{Co}_{0.2}\text{Mn}_{0.4}\text{O}_2$   
as cathode material for lithium-ion battery  
AUTHOR(S): Han, En-shan; Chang, Liang; Zhu, Ling-zhi; Li, Peng  
CORPORATE SOURCE: Dep. Appl. Chem., Sch. Chem. Eng. Technol., Hebei  
Univ. Technol., Tianjin, 300130, Peop. Rep. China  
SOURCE: Dianyuan Jishu (2006), 30(7), 543-545  
CODEN: DIJIFT; ISSN: 1002-087X  
PUBLISHER: Dianyuan Jishu Bianjibu  
DOCUMENT TYPE: Journal  
LANGUAGE: Chinese  
IT 602297-53-0, Cobalt manganese nickel hydroxide  
( $\text{Co}_{0.2}\text{Mn}_{0.4}\text{Ni}_{0.4}(\text{OH})_2$ )  
RL: TEM (Technical or engineered material use); USES (Uses)  
(synthesis and characterization of  $\text{LiNi}_{0.4}\text{Co}_{0.2}\text{Mn}_{0.4}\text{O}_2$  as cathode  
material for lithium-ion battery)

L7 ANSWER 3 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2006:592630 CAPLUS  
DOCUMENT NUMBER: 146:65557  
TITLE: Synthesis and characterization of high tap-density  
layered  $\text{Li}[\text{Ni}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}]\text{O}_2$  cathode material via  
hydroxide co-precipitation  
AUTHOR(S): Luo, Xufang; Wang, Xianyou; Liao, Li; Gamboa, Sergio;  
Sebastian, P. J.  
CORPORATE SOURCE: College of Chemistry, Xiangtan University, Hunan,  
411105, Peop. Rep. China  
SOURCE: Journal of Power Sources (2006), 158(1), 654-658  
CODEN: JPSODZ; ISSN: 0378-7753  
PUBLISHER: Elsevier B.V.  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
REFERENCE COUNT: 22 THERE ARE 22 CITED REFERENCES AVAILABLE FOR THIS  
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT  
IT 346417-97-8, Cobalt lithium manganese nickel oxide  
( $\text{Co}_{0.33}\text{LiMn}_{0.33}\text{Ni}_{0.33}\text{O}_2$ ) 602297-52-9, Cobalt manganese nickel  
hydroxide ( $\text{Co}_{0.33}\text{Mn}_{0.33}\text{Ni}_{0.33}(\text{OH})_2$ )  
RL: TEM (Technical or engineered material use); USES (Uses)  
(synthesis and characterization of high tap-d. layered cathode material  
via hydroxide co-precipitation)

L7 ANSWER 4 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2006:517317 CAPLUS  
DOCUMENT NUMBER: 145:11312

TITLE: Method of charging nonaqueous electrolyte secondary battery  
 INVENTOR(S): Nishida, Nobumichi; Inoue, Hidetoshi  
 PATENT ASSIGNEE(S): Sanyo Electric Co., Ltd., Japan  
 SOURCE: U.S. Pat. Appl. Publ., 7 pp.  
 CODEN: USXXCO  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2006115733	A1	20060601	US 2005-288355	20051129
JP 2006156230	A	20060615	JP 2004-347187	20041130
KR 2006060559	A	20060605	KR 2005-100878	20051025
CN 1783548	A	20060607	CN 2005-10127178	20051130

PRIORITY APPLN. INFO.: JP 2004-347187 A 20041130  
 IT 887748-06-3, Cobalt manganese nickel hydroxide  
 (Co0.34Mn0.33Ni0.33(OH)2)  
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)  
 (method of charging nonaq. electrolyte secondary battery)

L7 ANSWER 5 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2006:157979 CAPLUS  
 DOCUMENT NUMBER: 145:274707  
 TITLE: Investigation on the microscopic features of layered oxide Li[Ni1/3Co1/3Mn1/3]O2 and their influences on the cathode properties  
 AUTHOR(S): Shin, Yu-Ju; Choi, Woo-Jung; Hong, Young-Sik; Yoon, Seokwon; Ryu, Kwang Sun; Chang, Soon Ho  
 CORPORATE SOURCE: Department of Chemistry, Catholic University of Korea, Buchon, Kyeongki, 422-743, S. Korea  
 SOURCE: Solid State Ionics (2006), 177(5-6), 515-521  
 CODEN: SSIOD3; ISSN: 0167-2738  
 PUBLISHER: Elsevier B.V.  
 DOCUMENT TYPE: Journal  
 LANGUAGE: English  
 REFERENCE COUNT: 30 THERE ARE 30 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT  
 IT 602297-52-9, Cobalt manganese nickel hydroxide  
 (Co0.33Mn0.33Ni0.33(OH)2)  
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)  
 (in preparation of layered oxide Li[Ni1/3Co1/3Mn1/3]O2 cathode material for lithium batteries)

L7 ANSWER 6 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2006:116823 CAPLUS  
 DOCUMENT NUMBER: 144:174327  
 TITLE: Manufacture of cathode material for secondary lithium battery  
 INVENTOR(S): Wu, Mengtao; Chen, Botao; Huang, Laihe; Xu, Ning; Zhang, Ning  
 PATENT ASSIGNEE(S): Peop. Rep. China  
 SOURCE: Faming Zhuanli Shenqing Gongkai Shuomingshu, 7 pp.  
 CODEN: CNXXEV  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Chinese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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-----  
CN 1595680 A 20050316 CN 2004-10019741 20040625  
PRIORITY APPLN. INFO.: CN 2004-10019741 20040625  
IT 554-13-2, Lithium carbonate 1310-65-2, Lithium hydroxide (Li(OH))  
602297-52-9, Cobalt manganese nickel hydroxide  
(Co0.33Mn0.33Ni0.33(OH)2) 602297-53-0, Cobalt manganese nickel  
hydroxide (Co0.2Mn0.4Ni0.4(OH)2) 874753-63-6  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(manufacture of cathodes containing lithium manganese nickel composite  
oxides  
for secondary lithium batteries)

L7 ANSWER 7 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2006:50555 CAPLUS  
DOCUMENT NUMBER: 145:457448  
TITLE: Preparation of cathode material LiNi<sub>1</sub>/3Co<sub>1</sub>/3Mn<sub>1</sub>/3O<sub>2</sub>  
for lithium ion batteries from Ni-Co-Mn alloy by  
electrolyzing  
AUTHOR(S): Wu, Qingduan; Ye, Mao; Li, Yuzhan; Gao, Xueping; Yan,  
Jie  
CORPORATE SOURCE: Institute of New Energy Material Chemistry, Nankai  
University, Tianjin, 300071, Peop. Rep. China  
SOURCE: Nankai Daxue Xuebao, Ziran Kexueban (2005), 38(5),  
48-51  
CODEN: NDXZAG; ISSN: 0465-7942  
PUBLISHER: Nankai Daxue Xuebao Bianjibu  
DOCUMENT TYPE: Journal  
LANGUAGE: Chinese  
IT 602297-52-9P, Cobalt manganese nickel hydroxide  
(Co0.33Mn0.33Ni0.33(OH)2)  
RL: CPS (Chemical process); PEP (Physical, engineering or chemical  
process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process)  
(preparation of cathode material LiNi<sub>1</sub>/3Co<sub>1</sub>/3Mn<sub>1</sub>/3O<sub>2</sub> for lithium ion  
batteries from Ni-Co-Mn alloy by electrolyzing)

L7 ANSWER 8 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2005:1280758 CAPLUS  
DOCUMENT NUMBER: 145:474536  
TITLE: Electrochemical performance of Li(Ni<sub>1</sub>/3Co<sub>1</sub>/3Mn<sub>1</sub>/3)O<sub>2</sub>  
cathode material  
AUTHOR(S): Liu, Jing-jing; Qiu, Wei-hua; Li, Tao; Zhao, Hai-lei  
CORPORATE SOURCE: School of Material Science and Engineering, University  
of Science and Technology Beijing, Beijing, 100083,  
Peop. Rep. China  
SOURCE: Dianchi (2005), 35(5), 340-341  
CODEN: DNCHEP; ISSN: 1001-1579  
PUBLISHER: Dianchi Zazhishe  
DOCUMENT TYPE: Journal  
LANGUAGE: Chinese  
IT 96-49-1, Ethylene carbonate 105-58-8, Diethylcarbonate 616-38-6,  
Dimethylcarbonate 7439-93-2, Lithium, uses 9002-84-0, PTFE  
21324-40-3, Lithium hexafluorophosphate 65324-39-2, Celgard 2400  
346417-97-8, Cobalt lithium manganese nickel oxide  
(Co0.33LiMn0.33Ni0.33O2) 602297-52-9, Cobalt manganese nickel  
hydroxide (Co0.33Mn0.33Ni0.33(OH)2)  
RL: DEV (Device component use); NUU (Other use, unclassified); TEM  
(Technical or engineered material use); USES (Uses)  
(electrochem. performance of Li(Ni<sub>1</sub>/3Co<sub>1</sub>/3Mn<sub>1</sub>/3)O<sub>2</sub> cathode material)

L7 ANSWER 9 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2005:1253246 CAPLUS  
DOCUMENT NUMBER: 144:91079  
TITLE: Layered lithium transition metal composite oxide  
cathode material for secondary lithium battery and its

INVENTOR(S): manufacture  
 Duan, Xue; Wei, Min; Lu, Yanluo  
 PATENT ASSIGNEE(S): Beijing University of Chemical Technology, Peop. Rep.  
 China  
 SOURCE: Faming Zhuanli Shenqing Gongkai Shuomingshu, 12 pp.  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Chinese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 1606185	A	20050413	CN 2004-10009846	20041123
PRIORITY APPLN. INFO.:			CN 2004-10009846	20041123
IT 872355-89-0	872355-91-4	872355-93-6		
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative) (cathode materials containing lithium transition metal oxides for secondary lithium batteries)				

L7 ANSWER 10 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2005:1142666 CAPLUS  
 DOCUMENT NUMBER: 145:66108  
 TITLE: Effect of aluminum doping on electrochemical behaviors  
 of layered Li[Ni<sub>1/3</sub>Co<sub>1/3</sub>Mn<sub>1/3</sub>]O<sub>2</sub> cathode materials  
 AUTHOR(S): Ye, Shang-yun; Zhang, Ping-wei; Qiao, Zhi-yu  
 CORPORATE SOURCE: Department of Physics and Chemistry, University of  
 Science and Technology Beijing, Beijing, 100083, Peop.  
 Rep. China  
 SOURCE: Zhongguo Youse Jinshu Xuebao (2005), 15(Spec. 1),  
 51-55  
 CODEN: ZYJXFK; ISSN: 1004-0609  
 PUBLISHER: Kexue Chubanshe  
 DOCUMENT TYPE: Journal  
 LANGUAGE: English  
 REFERENCE COUNT: 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR THIS  
 RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT  
 IT 99627-76-6, Cobalt manganese nickel oxide (CoMnNiO<sub>4</sub>) 602297-52-9  
 , Cobalt manganese nickel hydroxide (Co<sub>0.33</sub>Mn<sub>0.33</sub>Ni<sub>0.33</sub>(OH)<sub>2</sub>)  
 RL: PRP (Properties)  
 (effect of aluminum doping on electrochem. behavior of layered  
 Li[Ni<sub>1/3</sub>Co<sub>1/3</sub>Mn<sub>1/3</sub>]O<sub>2</sub> cathode materials for lithium batteries)

L7 ANSWER 11 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2005:1106708 CAPLUS  
 DOCUMENT NUMBER: 143:389791  
 TITLE: Positive electrode active material for non-aqueous  
 electrolyte secondary battery, production method  
 thereof, and non-aqueous electrolyte secondary battery  
 using the same  
 INVENTOR(S): Kogetsu, Yasutaka; Saito, Takaya; Ozaki, Yoshiyuki  
 PATENT ASSIGNEE(S): Matsushita Electric Industrial Co., Ltd., Japan  
 SOURCE: U.S. Pat. Appl. Publ., 15 pp.  
 CODEN: USXXCO  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2005227147	A1	20051013	US 2005-97280	20050404
JP 2005322616	A	20051117	JP 2005-40315	20050217
KR 2006045560	A	20060517	KR 2005-28918	20050407

CN 1658414 A 20050824 CN 2005-10065120 20050408  
PRIORITY APPLN. INFO.: JP 2004-113825 A 20040408  
IT 1310-66-3, Lithium hydroxide monohydrate 678138-54-0, Cobalt nickel hydroxide (Co0.03Ni0.97(OH)2) 866557-68-8, Aluminum cobalt nickel hydroxide (Al0.05Co0.2Ni0.75(OH)2) 866557-70-2, Aluminum cobalt nickel hydroxide (Al0.03Co0.1Ni0.87(OH)2) 866557-72-4, Cobalt manganese nickel hydroxide (Co0.33Mn0.33Ni0.34(OH)2)  
RL: TEM (Technical or engineered material use); USES (Uses)  
(pos. electrode active material for non-aqueous electrolyte secondary battery, production method thereof, and non-aqueous electrolyte secondary battery using same)

L7 ANSWER 12 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2005:1087200 CAPLUS  
DOCUMENT NUMBER: 145:127385  
TITLE: Synthesis and performances of cathode material LiNi<sub>1</sub>/3Co<sub>1</sub>/3Mn<sub>1</sub>/3O<sub>2</sub>  
AUTHOR(S): Li, Peng; Han, En-shan; Xu, Ning; Xu, Gang; Zhang, Shao-li  
CORPORATE SOURCE: Department of Applied Chemistry, School of Chemical Engineering and Technology, Hebei University of Technology, Tianjin, 300130, Peop. Rep. China  
SOURCE: Dianyuan Jishu (2005), 29(8), 511-514  
CODEN: DIJIFT; ISSN: 1002-087X  
PUBLISHER: Dianyuan Jishu Bianjibu  
DOCUMENT TYPE: Journal  
LANGUAGE: Chinese  
IT 1310-65-2, Lithium hydroxide (Li(OH)) 602297-52-9, Cobalt manganese nickel hydroxide (Co0.33Mn0.33Ni0.33(OH)2)  
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)  
(synthesis and performances of cathode material LiNi<sub>1</sub>/3Co<sub>1</sub>/3Mn<sub>1</sub>/3O<sub>2</sub>)

L7 ANSWER 13 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2005:1012048 CAPLUS  
DOCUMENT NUMBER: 144:373186  
TITLE: Cobalt sulfates from the Letneye massive sulfide copper ore deposit (southern Urals)  
AUTHOR(S): Belogub, E. V.; Shcherbakova, E. P.; Moroz, T. N.; Novoselov, K. A.  
CORPORATE SOURCE: Inst. Mineral., UrO RAN, Miass, 456317, Russia  
SOURCE: Zapiski Rossiiskogo Mineralogicheskogo Obshchestva (2005), 134(3), 94-100  
CODEN: ZRMOBN  
PUBLISHER: Sankt-Peterburgskaya Izdatel'skaya Firma RAN "Nauka"  
DOCUMENT TYPE: Journal  
LANGUAGE: Russian  
IT 882403-79-4, Cuprian zincian bieberite 882403-89-6, Cuprian magnesian goslarite 882403-97-6, Cuprian zincian cobaltkieserite 882404-06-0, Cuprian zincian moorhouseite 882404-08-2, Cobaltoan cuprian bianchite  
RL: GFM (Geological or astronomical formation); PRP (Properties); FORM (Formation, nonpreparative)  
(composition and genesis of cobalt sulfates from Letneye massive sulfide copper ore deposit, southern Urals, Russia)

L7 ANSWER 14 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2005:1006766 CAPLUS  
DOCUMENT NUMBER: 143:443425  
TITLE: Structure, electrochemical properties, and thermal stability studies of Li[Ni0.2Co0.6Mn0.2]O<sub>2</sub> - Effect of synthesis route  
AUTHOR(S): Jiang, J.; Eberman, K. W.; Krause, L. J.; Dahn, J. R.

CORPORATE SOURCE: Department of Chemistry, Dalhousie University,  
 Halifax, NS, B3H 3J5, Can.  
 SOURCE: Journal of the Electrochemical Society (2005), 152(9),  
 A1874-A1878  
 CODEN: JESOAN; ISSN: 0013-4651  
 PUBLISHER: Electrochemical Society  
 DOCUMENT TYPE: Journal  
 LANGUAGE: English  
 REFERENCE COUNT: 18 THERE ARE 18 CITED REFERENCES AVAILABLE FOR THIS  
 RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT  
 IT 554-13-2, Lithium carbonate (Li<sub>2</sub>CO<sub>3</sub>) 1310-65-2, Lithium hydroxide  
 (Li(OH)) 21041-93-0, Cobalt hydroxide (Co(OH)<sub>2</sub>) 499795-31-2,  
 Cobalt manganese nickel hydroxide (Co<sub>0.6</sub>Mn<sub>0.2</sub>Ni<sub>0.2</sub>(OH)<sub>2</sub>)  
 868844-95-5, Cobalt manganese nickel hydroxide  
 (Co<sub>0.17</sub>Mn<sub>0.42</sub>Ni<sub>0.42</sub>(OH)<sub>2</sub>)  
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical  
 process); PROC (Process)  
 (in synthesis of Li[Ni<sub>0.2</sub>Co<sub>0.6</sub>Mn<sub>0.2</sub>]O<sub>2</sub> cathode material for lithium  
 batteries)

L7 ANSWER 15 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2005:821828 CAPLUS  
 DOCUMENT NUMBER: 143:369924  
 TITLE: Hydrothermal synthesis of layered  
 Li[Ni<sub>1/3</sub>Co<sub>1/3</sub>Mn<sub>1/3</sub>]O<sub>2</sub> as positive electrode material  
 for lithium secondary battery  
 AUTHOR(S): Myung, Seung-Taek; Lee, Myung-Hun; Komaba, Shinichi;  
 Kumagai, Naoaki; Sun, Yang-Kook  
 CORPORATE SOURCE: VK Corporation, Kyonggi-Do, 450-090, S. Korea  
 SOURCE: Electrochimica Acta (2005), 50(24), 4800-4806  
 CODEN: ELCAAV; ISSN: 0013-4686  
 PUBLISHER: Elsevier B.V.  
 DOCUMENT TYPE: Journal  
 LANGUAGE: English  
 REFERENCE COUNT: 25 THERE ARE 25 CITED REFERENCES AVAILABLE FOR THIS  
 RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT  
 IT 1310-65-2, Lithium hydroxide 602297-52-9, Cobalt manganese  
 nickel hydroxide (Co<sub>0.33</sub>Mn<sub>0.33</sub>Ni<sub>0.33</sub>(OH)<sub>2</sub>)  
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical  
 process); PROC (Process)  
 (in hydrothermal synthesis of layered cobalt lithium manganese nickel  
 oxide as cathode material for lithium secondary batteries)

L7 ANSWER 16 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2005:402673 CAPLUS  
 DOCUMENT NUMBER: 142:466432  
 TITLE: Secondary battery with non-aqueous electrolyte  
 INVENTOR(S): Ohzuku, Tsutomu; Yoshizawa, Hiroshi; Nakura, Kensuke  
 PATENT ASSIGNEE(S): Matsushita Electric Industrial Co., Ltd., Japan  
 SOURCE: Eur. Pat. Appl., 32 pp.  
 CODEN: EPXXDW  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 2  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1530248	A2	20050511	EP 2004-256668	20041028
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, PL, SK, HR				
JP 2005142047	A	20050602	JP 2003-377954	20031107
KR 2005044279	A	20050512	KR 2004-89762	20041105
CN 1614808	A	20050511	CN 2004-10092311	20041108

PRIORITY APPLN. INFO.: JP 2003-377954 A 20031107  
IT 147098-72-4, Cobalt nickel hydroxide ( $\text{Co}_0.5\text{Ni}_0.5(\text{OH})_2$ ) 602297-52-9  
, Cobalt manganese nickel hydroxide ( $\text{Co}_0.33\text{Mn}_0.33\text{Ni}_0.33(\text{OH})_2$ )  
RL: CPS (Chemical process); PEP (Physical, engineering or chemical  
process); PROC (Process)  
(in preparation of cathode material for secondary battery with non-aqueous  
electrolyte)

L7 ANSWER 17 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2005:58090 CAPLUS  
DOCUMENT NUMBER: 142:138345  
TITLE: Method of preparation of cathode active material for  
rechargeable lithium battery  
INVENTOR(S): Jung, Hyun-sook; Kim, Geun-bae  
PATENT ASSIGNEE(S): S. Korea  
SOURCE: U.S. Pat. Appl. Publ., 12 pp.  
CODEN: USXXCO  
DOCUMENT TYPE: Patent  
LANGUAGE: English  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2005014065	A1	20050120	US 2004-892991	20040716
KR 2005010131	A	20050127	KR 2003-49020	20030718
CN 1610154	A	20050427	CN 2004-10044544	20040512
JP 2005044801	A	20050217	JP 2004-211609	20040720

PRIORITY APPLN. INFO.: KR 2003-49020 A 20030718  
IT 546-89-4, Lithium acetate 1310-65-2, Lithium hydroxide 7790-69-4,  
Lithium nitrate 602297-52-9, Cobalt manganese nickel hydroxide  
( $\text{Co}_0.33\text{Mn}_0.33\text{Ni}_0.33(\text{OH})_2$ ) 824957-53-1  
RL: CPS (Chemical process); PEP (Physical, engineering or chemical  
process); PROC (Process)  
(method of preparation of cathode active material for rechargeable lithium  
battery)

L7 ANSWER 18 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2004:938580 CAPLUS  
DOCUMENT NUMBER: 142:117511  
TITLE: Synthetic optimization of  $\text{Li}[\text{Ni}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}]_{\text{O}2}$  via  
co-precipitation  
AUTHOR(S): Lee, M.-H.; Kang, Y.-J.; Myung, S.-T.; Sun, Y.-K.  
CORPORATE SOURCE: Department of Chemical Engineering, Center for  
Information and Communication Materials, Hanyang  
University, Seoul, 133-791, S. Korea  
SOURCE: Electrochimica Acta (2004), 50(4), 939-948  
CODEN: ELCAAV; ISSN: 0013-4686  
PUBLISHER: Elsevier B.V.  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
REFERENCE COUNT: 19 THERE ARE 19 CITED REFERENCES AVAILABLE FOR THIS  
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT  
IT 602297-52-9P, Cobalt manganese nickel hydroxide  
( $\text{Co}_0.33\text{Mn}_0.33\text{Ni}_0.33(\text{OH})_2$ )  
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT  
(Reactant or reagent)  
(synthesis and lithium hydroxide reaction with; synthesis optimization  
of  $\text{Li}[\text{Ni}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}]_{\text{O}2}$  via co-precipitation for fabrication of battery  
cathodes)

L7 ANSWER 19 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2004:392155 CAPLUS  
DOCUMENT NUMBER: 140:378109

TITLE: Nonaqueous electrolyte secondary battery  
 INVENTOR(S): Kinoshita, Akira; Fujimoto, Hiroyuki; Takahashi,  
                  Yasufumi; Fujihara, Toyoki; Tode, Shingo; Nakane,  
                  Ikuro; Fujitani, Shin  
 PATENT ASSIGNEE(S): Japan  
 SOURCE: U.S. Pat. Appl. Publ., 12 pp.  
 CODEN: USXXCO  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2004091780	A1	20040513	US 2003-701572	20031106
JP 2004158352	A	20040603	JP 2002-324173	20021107
KR 2004032805	A	20040417	KR 2003-78208	20031106
CN 1499663	A	20040526	CN 2003-10103627	20031106
PRIORITY APPLN. INFO.:			JP 2002-324173	A 20021107
IT 602297-52-9, Cobalt manganese nickel hydroxide Co0.33Mn0.33Ni0.33(OH)2				
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)				
(nonaqueous electrolyte secondary battery)				

L7 ANSWER 20 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2003:757155 CAPLUS  
 DOCUMENT NUMBER: 139:263345  
 TITLE: Nonaqueous electrolyte secondary battery  
 INVENTOR(S): Fujimoto, Hiroyuki; Fujihara, Toyoki; Kamino, Maruo  
 PATENT ASSIGNEE(S): Japan  
 SOURCE: U.S. Pat. Appl. Publ., 8 pp.  
 CODEN: USXXCO  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2003180617	A1	20030925	US 2003-390722	20030319
JP 2003282048	A	20031003	JP 2002-79944	20020322
JP 3744870	B2	20060215		
CN 1447465	A	20031008	CN 2003-107286	20030321
PRIORITY APPLN. INFO.:			JP 2002-79944	A 20020322
IT 1310-65-2, Lithium hydroxide 244129-80-4, Manganese nickel hydroxide Mn0.5Ni0.5(OH)2 602297-52-9, Cobalt manganese nickel hydroxide (Co0.33Mn0.33Ni0.33(OH)2) 602297-53-0, Cobalt manganese nickel hydroxide (Co0.2Mn0.4Ni0.4(OH)2)				
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)				
(improved cathode for nonaqueous electrolyte secondary battery)				

L7 ANSWER 21 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2003:16 CAPLUS  
 DOCUMENT NUMBER: 138:197672  
 TITLE: Preparation, Structure, and Thermal Stability of New NixCo1-2xMnx(OH)2 (0 ≤ x ≤ 1/2) Phases  
 AUTHOR(S): Jouanneau, S.; Dahn, J. R.  
 CORPORATE SOURCE: Department of Physics, Dalhousie University, Halifax, NS, B3H 3J5, Can.  
 SOURCE: Chemistry of Materials (2003), 15(2), 495-499  
 CODEN: CMATEX; ISSN: 0897-4756  
 PUBLISHER: American Chemical Society

DOCUMENT TYPE: Journal  
 LANGUAGE: English  
 REFERENCE COUNT: 27 THERE ARE 27 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

IT 244129-80-4P, Manganese nickel hydroxide ( $Mn0.5Ni0.5(OH)2$ )  
 499795-30-1P, Cobalt manganese nickel hydroxide ( $Co0.8Mn0.1Ni0.1(OH)2$ ) 499795-31-2P, Cobalt manganese nickel hydroxide ( $Co0.6Mn0.2Ni0.2(OH)2$ ) 499795-32-3P, Cobalt manganese nickel hydroxide ( $Co0.4Mn0.3Ni0.3(OH)2$ ) 499795-33-4P, Cobalt manganese nickel hydroxide ( $Co0.25Mn0.38Ni0.38(OH)2$ ) 499795-38-9P, Cobalt manganese nickel hydroxide ( $Co0.1Mn0.0.5Ni0.5(OH)2$ )  
 RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation) (preparation, XRD and thermal decomposition of)

L7 ANSWER 22 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2002:516614 CAPLUS  
 DOCUMENT NUMBER: 137:96234  
 TITLE: Mixed metal-nickel hydroxide material for fabrication of battery cathodes  
 INVENTOR(S): Fierro, Cristian; Fetcenko, Michael A.; Ovshinsky, Stanford R.; Corrigan, Dennis A.; Sommers, Beth; Zallen, Avram  
 PATENT ASSIGNEE(S): Ovonic Battery Company, Inc., USA  
 SOURCE: U.S., 11 pp., Cont.-in-part of U.S. 135,477.  
 CODEN: USXXAM  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 8  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 6416903	B1	20020709	US 2000-619039	20000718
US 6177213	B1	20010123	US 1998-135460	19980817
US 6228535	B1	20010508	US 1998-135477	19980817
EP 1496555	A2	20050112	EP 2004-24169	19990811
R: DE, FR, GB				
EP 1672724	A2	20060621	EP 2006-3365	19990812
EP 1672724	A3	20061025		
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, FI, CY				
EP 1744387	A2	20070117	EP 2006-23021	19990812
R: DE, FR, GB				
CA 2415471	A1	20020124	CA 2001-2415471	20010706
WO 2002007238	A1	20020124	WO 2001-US21443	20010706
W: AU, BR, CA, CN, IN, JP, KR, MX, NO, RU, SG, UA				
RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR				
EP 1301952	A1	20030416	EP 2001-952494	20010706
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR				
BR 2001012611	A	20030610	BR 2001-12611	20010706
CN 1443375	A	20030917	CN 2001-813011	20010706
JP 2004504698	T	20040212	JP 2002-513032	20010706
CN 1897335	A	20070117	CN 2006-10081893	20010706
TW 522598	B	20030301	TW 2001-90117275	20010716
JP 2004214210	A	20040729	JP 2004-43303	20040219
PRIORITY APPLN. INFO.:				
		US 1998-135460	A2	19980817
		US 1998-135477	A2	19980817
		EP 1999-939133	A3	19990811
		JP 2000-565576	A3	19990811
		EP 1999-939741	A3	19990812
		US 2000-619039	A	20000718
		CN 2001-813011	A3	20010706

WO 2001-US21443 W 20010706

REFERENCE COUNT: 5 THERE ARE 5 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

IT 155472-21-2P, Cobalt nickel hydroxide ((Co,Ni)(OH)2) 196006-84-5P, Cobalt nickel hydroxide (Co0.05Ni0.95(OH)2) 391208-18-7P, Cobalt nickel zinc hydroxide ((Co,Ni,Zn)(OH)2) 391208-19-8P 391208-20-1P 391208-21-2P 391208-22-3P, Calcium cobalt nickel hydroxide (Ca0.01Co0.03Ni0.95(OH)2) 391208-23-4P, Cobalt nickel zinc hydroxide (Co0.04Ni0.91Zn0.04(OH)2) 391208-24-5P, Calcium cobalt nickel hydroxide (Ca0.01Co0.07Ni0.91(OH)2) 391208-25-6P, Cobalt nickel zinc hydroxide (Co0.03Ni0.95Zn0.02(OH)2) 391208-26-7P, Cobalt nickel zinc hydroxide (Co0.07Ni0.88Zn0.04(OH)2) 441288-29-5P, Calcium magnesium nickel hydroxide (Ca0.01Mg0.05Ni0.93(OH)2) 441288-32-0P, Calcium cobalt nickel hydroxide (Ca0.01Co0.03Ni0.93(OH)2)

RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)

(battery cathode material; mixed metal-nickel hydroxide material for fabrication of battery cathodes)

L7 ANSWER 23 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2002:72467 CAPLUS

DOCUMENT NUMBER: 136:121127

TITLE: Method for preparation of multilayered nickel hydroxide cathode material

INVENTOR(S): Fierro, Cristian; Fetcenko, Michael A.; Ovshinsky, Stanford R.; Corrigan, Dennis A.; Sommers, Beth

PATENT ASSIGNEE(S): Ovonic Battery Company, Inc., USA

SOURCE: PCT Int. Appl., 29 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 8

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2002007238	A1	20020124	WO 2001-US21443	20010706
W: AU, BR, CA, CN, IN, JP, KR, MX, NO, RU, SG, UA RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR				
US 6416903	B1	20020709	US 2000-619039	20000718
CA 2415471	A1	20020124	CA 2001-2415471	20010706
EP 1301952	A1	20030416	EP 2001-952494	20010706
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR				
BR 2001012611	A	20030610	BR 2001-12611	20010706
JP 2004504698	T	20040212	JP 2002-513032	20010706
PRIORITY APPLN. INFO.:			US 2000-619039	A 20000718
			US 1998-135460	A2 19980817
			US 1998-135477	A2 19980817
			WO 2001-US21443	W 20010706

REFERENCE COUNT: 4 THERE ARE 4 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

IT 155472-21-2, Cobalt nickel hydroxide ((Co,Ni)(OH)2) 196006-84-5, Cobalt nickel hydroxide Co0.05Ni0.95(OH)2 391208-18-7, Cobalt nickel zinc hydroxide ((Co,Ni,Zn)(OH)2) 391208-19-8 391208-20-1 391208-21-2 391208-23-4, Cobalt nickel zinc hydroxide (Co0.04Ni0.91Zn0.04(OH)2) 391208-25-6, Cobalt nickel zinc hydroxide (Co0.03Ni0.95Zn0.02(OH)2)

RL: DEV (Device component use); USES (Uses)

(method for preparation of multilayered nickel hydroxide cathode material)

L7 ANSWER 24 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 1991:66017 CAPLUS

DOCUMENT NUMBER: 114:66017  
 TITLE: Structural hierarchy in M[6]T[4].vphi.n minerals  
 AUTHOR(S): Hawthorne, Frank C.  
 CORPORATE SOURCE: Dep. Geol. Sci., Univ. Manitoba, Winnipeg, MB, R3T  
 2N2, Can.  
 SOURCE: Zeitschrift fuer Kristallographie (1990), 192(1-2),  
 1-52  
 CODEN: ZEKRDZ; ISSN: 0044-2968  
 DOCUMENT TYPE: Journal  
 LANGUAGE: English  
 IT 1302-58-5, Amblygonite 1318-31-6, Clinozoisite 1318-45-2, Dickite  
 1318-49-6, Epidote 1318-72-5, Kainite 1318-74-7, Kaolinite, properties  
 1318-81-6, Lawsonite 1319-12-6, Pumpellyite 1319-39-7, Roesslerite  
 1319-42-2, Zoisite 11089-72-8, Varulite-NaNa ((Mn1-1.5Fe0.5-1)MnNa(Na0.5-  
 1Ca0-0.5)(PO4)3) 12004-28-3, Palermoite 12006-42-7, Arthurite  
 12025-97-7, Uklonskovite 12053-86-0, Linarite 12062-75-8, Tavorite  
 12068-50-7, Halloysite 12135-61-4, Titanite 12172-70-2, Allanite  
 12172-72-4, Alluaudite 12174-22-0, Piemontite 12198-53-7, Lazulite  
 12198-84-4, Natromontebrasite 12206-95-0, Fibroferrite 12211-29-9,  
 Ardennite 12211-42-6, Scorzalite 12218-55-2, Leucophosphite  
 12244-16-5, Endellite 12260-00-3, Childrenite 12260-04-7, Montebrasite  
 12267-58-2, Paravauxite 12267-88-8, Isokite 12274-61-2,  
 Hagendorfite-NaNa [(Fe0.5-1Mg0-0.5)1-1.5Fe0.5-1]MnNa(Na0.5-1Ca0-  
 0.5)(PO4)3) 12279-65-1, Nacrite 12284-84-3, Liroconite 12297-96-0,  
 Strunzite 12313-62-1, Gabrielsonite 12325-36-9, Mottramite  
 12337-04-1, Amarantite 12343-52-1, Metavauxite 12350-25-3, Mitridatite  
 12413-59-1, Aplowite 12414-10-7, Bermanite 12415-36-0,  
 Eosphorite 12416-31-8, Hancockite 12416-52-3, Holdenite 12417-43-5,  
 Lacroixite 12417-80-0, Morinite 12417-91-3, Veszelyite 12418-01-8,  
 Durangite 12418-22-3, Gordonite (Mg[Al(OH)(PO4)]2.8H2O) 12418-52-9,  
 Arseniosiderite 12418-83-6, Chlorothionite 12418-91-6, Butlerite  
 12418-92-7, Hohmannite 12419-94-2, Minyulite 12420-03-0, Moorhouseite  
 12420-18-7, Nickel hexahydrite 12421-00-0, Pseudolaueite 12424-68-9,  
 Sigloite 12426-43-6, Tilasite 12426-77-6, Parabutlerite 12518-72-8,  
 Stewartite 12601-23-9, Julgoldite 13587-33-2, Poitevinite  
 13759-09-6, Morenosite 13778-97-7, Hexahydrite 13817-21-5,  
 Chalcanthite 13824-49-2, Strengite 13824-50-5, Variscite 14457-55-7,  
 Epsomite 14567-64-7, Kieserite 14567-68-1, Szomolnokite 14567-70-5,  
 Siderotil 14567-75-0, Phosphosiderite 14567-77-2, Plancheite  
 14654-06-9, Clinoenstatite 14654-10-5, Phosphorrosslerite  
 (Mg(HPO4).7H2O) 14654-11-6, Newberryite 14654-14-9, Kolbeckite  
 14681-78-8, Orthoenstatite 14752-50-2, Metavariscite 15230-85-0,  
 Clinofersilite 15318-72-6, Laueite 15422-36-3, Orthoferrosilite  
 15490-91-2, Struvite 15491-15-3, Goslarite 15491-23-3, Melanterite  
 15553-21-6, Pentahydrite 15606-25-4, Dioptase 15652-21-8, Barbosalite  
 15669-02-0, Malayaite 16094-11-4, Conichalcite 16263-38-0, Austinite  
 17068-62-1, Hypersthene 19004-61-6, Descloizite 20775-42-2, Retgersite  
 20909-44-8, Scorodite 21793-55-5, Mansfieldite 22206-42-4,  
 Calciovoltorthite 23540-24-1, Pyrobelonite 23625-76-5, Adelite  
 24189-48-8, Gunningite 24189-58-0, Clinohypersthene 24189-61-5,  
 Duftite 24250-37-1, Bieberite (Co(SO4).7H2O) 24250-39-3, Bonattite  
 24250-46-2, Carminite 24250-50-8, Bianchite 24378-28-7, Boothite  
 24378-31-2, Starkeyite 33636-44-1, Tsumcorite 39473-77-3,  
 Melonjosephite 51184-69-1, Jagowerite (Ba[Al(OH)(PO4)]2) 51198-90-4,  
 Robertsite 51340-44-4, Khademite 52717-37-0, Szmikite 53125-64-7,  
 Brassite 54652-49-2, Whitmoreite 58206-65-8, Fogsite 59042-33-0,  
 Krautite (Mn(HAsO4).H2O) 59492-33-0, Jurbanite 60867-12-1, Vuagnatite  
 61026-43-5, Bertossaite 64476-46-6, Rozenite 66183-78-6,  
 Ferrohexahydrite 66457-84-9, Ferropumpellyite 67712-23-6, Boyleite  
 68108-22-5, Jokokuite (Mn(SO4).5H2O) 70315-78-5, Ilesite 70878-67-0,  
 Koritnigite 72276-48-3, Maghagendorfite-Na [(Mg0.5-1Fe0-0.5)1-1.5Fe0.5-  
 1]Mn(Na0.5-1Ca0-0.5)[(PO4)2(HPO4)]) 73347-41-8, Mallardite 73729-55-2,  
 Zinc-melanterite 74410-63-2, Fluckite 75137-72-3, Schmiederite  
 75797-73-8, Medaite 75797-77-2, Tiragalloite 79078-56-1,

Cobalt-koritnigite 80147-36-0, Ojuelaite 80487-65-6, Cechite  
80487-70-3, Panasqueiraite 80487-72-5, Shuiskite 83061-39-6,  
Arsendescloizite 83061-40-9, Kolfanite 83380-55-6, Dwornikite  
85712-31-8, Ushkovite 88201-08-5, Ferrostrunzite 93442-96-7,  
Earlshannonite 127030-85-7, Allanite-(Y)

RL: PRP (Properties)

(classification of, into crystal-structure hierarchy group based on  
bond valence theory)

L7 ANSWER 25 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 1979:424121 CAPLUS

DOCUMENT NUMBER: 91:24121

TITLE: An unusual efflorescence (aplowite) on Neogene rocks  
from the Isthmus of Corinth

AUTHOR(S): Schnitzer, W. A.

CORPORATE SOURCE: Univ. Wuerzburg, Wuerzburg, Fed. Rep. Ger.

SOURCE: Annales Geologiques des Pays Helleniques (1977), 28,  
349-51

CODEN: AGPHA4; ISSN: 0402-4664

DOCUMENT TYPE: Journal

LANGUAGE: German

IT 12413-59-1 13397-26-7, occurrence 13778-97-7 24492-87-3

RL: PROC (Process)

(efflorescence of, on Neogene rocks, of Isthmus of Corinth)

L7 ANSWER 26 OF 26 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 1978:123953 CAPLUS

DOCUMENT NUMBER: 88:123953

TITLE: Unusual salt efflorescence from the Neogene rocks of  
the Isthmus of Corinth

AUTHOR(S): Schnitzer, W. A.

CORPORATE SOURCE: Inst. Geol., Univ. Wuerzburg, Wuerzburg, Fed. Rep.  
Ger.

SOURCE: Proc. - Int. Congr. Therm. Waters, Geotherm. Energy  
Vulcanism Mediterr. Area (1976), 2, 494-6

CODEN: PGENDX

DOCUMENT TYPE: Journal

LANGUAGE: German

AB The green-beige efflorescences are partially water- and acid-soluble. In  
either solution, Ca<sup>2+</sup>, Mg<sup>2+</sup>, Na<sup>+</sup>, SO<sub>4</sub><sup>2-</sup>, and Cl<sup>-</sup> ions were identified,  
suggesting that these efflorescences were composed of MgSO<sub>4</sub>, calcite,  
NaCl, and gypsum. X-ray diffraction anal. confirmed that the  
efflorescences consisted of leonhardtite [1318-80-5], hexahydrite  
[13778-97-7], calcite, and trace amount of gypsum. In some efflorescences  
aplowite [12413-59-1] was identified.

IT 1318-80-5 7487-88-9, uses and miscellaneous 12413-59-1

13397-24-5, uses and miscellaneous 13397-26-7, uses and miscellaneous  
13778-97-7

RL: OCCU (Occurrence)

(in salt efflorescence, of Isthmus of Corinth)

=> FIL STNGUIDE

COST IN U.S. DOLLARS

SINCE FILE	TOTAL
ENTRY	SESSION

FULL ESTIMATED COST

47.07 103.53

DISCOUNT AMOUNTS (FOR QUALIFYING ACCOUNTS)

SINCE FILE	TOTAL
ENTRY	SESSION

CA SUBSCRIBER PRICE

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DICTIONARY FILE UPDATES: 6 MAY 2007 HIGHEST RN 934336-20-6

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<http://www.cas.org/support/stngen/stndoc/properties.html>

=> s (0.9-1.3)/Li and (0.025-0.45)/Ni and (0.1-0.95)/Co and (0.025-0.45)/Mn  
105564 (0.9-1.3)/LI  
13681 (0.025-0.45)/NI  
17048 (0.1-0.95)/CO  
13669 (0.025-0.45)/MN  
L1 745 (0.9-1.3)/LI AND (0.025-0.45)/NI AND (0.1-0.95)/CO AND (0.025-0.  
45)/MN

=> file caplus COST IN U.S. DOLLARS	SINCE FILE ENTRY	TOTAL SESSION
FULL ESTIMATED COST	22.05	22.26

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FILE LAST UPDATED: 6 May 2007 (20070506/ED)

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<http://www.cas.org/infopolicy.html>

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233729 SINTER?  
L3 24 L2 AND SINTER?

=> s 13 and heat?  
2413365 HEAT?  
L4 5 L3 AND HEAT?

=> d 14 1-5 ibib

L4 ANSWER 1 OF 5 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2006:882777 CAPLUS  
DOCUMENT NUMBER: 145:380322  
TITLE: Cathode material for lithium secondary batteries and its preparation  
INVENTOR(S): Chen, Gang; Li, Xu; Wang, Chunzhong; Du, Fei; Huang, Zufei  
PATENT ASSIGNEE(S): Jilin University, Peop. Rep. China  
SOURCE: Faming Zhanli Shengqing Gongkai Shuomingshu, 9pp.  
CODEN: CNXXEV  
DOCUMENT TYPE: Patent  
LANGUAGE: Chinese  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 1821080	A	20060823	CN 2006-10016647	20060313
PRIORITY APPLN. INFO.:			CN 2006-10016647	20060313

L4 ANSWER 2 OF 5 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2005:493050 CAPLUS  
DOCUMENT NUMBER: 143:29495  
TITLE: Cathode active mass for secondary lithium battery, its manufacture, and the battery  
INVENTOR(S): Nakajima, Motoe; Inada, Fumi; Uchikawa, Akio  
PATENT ASSIGNEE(S): Hitachi Metals, Ltd., Japan  
SOURCE: Jpn. Kokai Tokkyo Koho, 10 pp.  
CODEN: JKXXAF  
DOCUMENT TYPE: Patent  
LANGUAGE: Japanese  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2005150102	A	20050609	JP 2004-306421	20041021
PRIORITY APPLN. INFO.:			JP 2003-364436	A 20031024

L4 ANSWER 3 OF 5 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2004:944682 CAPLUS  
DOCUMENT NUMBER: 142:97317  
TITLE: Effect of the Sintering Agent, B<sub>2</sub>O<sub>3</sub>, on Li[NixCo<sub>1-2x</sub>Mnx]O<sub>2</sub> Materials  
AUTHOR(S): Jouanneau, S.; Bahmet, W.; Eberman, K. W.; Krause, L. J.; Dahn, J. R.

CORPORATE SOURCE: Department of Physics and Atmospheric Science,  
Dalhousie University, Halifax, NS, B3H 3J5, Can.  
SOURCE: Journal of the Electrochemical Society (2004),  
151(11), A1789-A1796  
CODEN: JESOAN; ISSN: 0013-4651  
PUBLISHER: Electrochemical Society  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
REFERENCE COUNT: 24 THERE ARE 24 CITED REFERENCES AVAILABLE FOR THIS  
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 4 OF 5 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2004:833681 CAPLUS  
DOCUMENT NUMBER: 142:25771  
TITLE: Influence of LiF Additions on Li[NixCo1-2xMnx]O2  
Materials  
AUTHOR(S): Jouanneau, S.; Dahn, J. R.  
CORPORATE SOURCE: Department of Physics and Atmospheric Science,  
Dalhousie University, Halifax, NS, B3H 3J5, Can.  
SOURCE: Journal of the Electrochemical Society (2004),  
151(10), A1749-A1754  
CODEN: JESOAN; ISSN: 0013-4651  
PUBLISHER: Electrochemical Society  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
REFERENCE COUNT: 24 THERE ARE 24 CITED REFERENCES AVAILABLE FOR THIS  
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 5 OF 5 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 1999:388614 CAPLUS  
DOCUMENT NUMBER: 131:47194  
TITLE: Manufacture of cathode active mass by firing lithium  
mixed oxide for lithium secondary batteries  
INVENTOR(S): Yoshida, Tomokazu; Kita, Yoshinori; Fujimoto,  
Masahisa; Noma, Toshiyuki; Nishio, Koji  
PATENT ASSIGNEE(S): Sanyo Electric Co., Ltd., Japan  
SOURCE: Jpn. Kokai Tokkyo Koho, 4 pp.  
CODEN: JKXXAF  
DOCUMENT TYPE: Patent  
LANGUAGE: Japanese  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 11162466	A	19990618	JP 1997-347152	19971201

PRIORITY APPLN. INFO.: